

Do not smoke and make certain there are no open flames in the immediate area when filling the fuel tank. Keep the container in contact with the tank being filled, or provide a ground to prevent a spark from igniting the fuel vapors.

DURING OPERATION

Do not wear loosely hanging clothing or neck ties on the job. Wear goggles or safety glasses, gloves, and hard hats during crushing operations.

Be sure all guards and covers are installed in their proper locations.

Do not operate the engine in an enclosed area unless the exhaust fumes are piped to the outside. Inhalation of exhaust fumes may result in serious illness or death.

Stand clear of hauling equipment that is dumping material into the hopper.

Keep the equipment firmly blocked while operating.

Always keep hands clear of moving parts. Never attempt to wipe oil, refuel, or make adjustments while the plant is in operation.

Report or correct any conditions that may result in injury to personnel if operation is to be continued.

AFTER OPERATION

Make adjustments in a proper manner. Be sure all guards and covers are properly installed after adjustment or maintenance operation.

Do not perform welding operation until the welder ground is placed as near to the area of welding as possible to prevent possible arcing through bearings or other vital parts.

Do not use a lifting device with a capacity of less than 12,500 pounds when lifting a major assembly. Use an adequate lifting device when lifting heavy components. Do not allow suspended major assemblies or components to swing. Failure to observe this warning may result in serious injury or death to personnel.

Never leave a heavy assembly or component in an unstable position that could result in the assembly or component falling on personnel.

MANUFACTURING COMPANY MODEL 2A-2A)
FSN 3820-851-6728, COMPONENT OF CRUSHING AND
SCREENING PLANT, DIESEL ENGINE DRIVEN,
FSN 3820-878-4285

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the "Iowa Manufacturing Model 2A-2A Portable Jaw Crusher." They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations.

b. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General,

U. S. Army Mobility Equipment Command
ATTN: AMSME-MPP, 4300 Goodfellow
Boulevard, St. Louis, Mo. 63120.

c. Report all equipment improvements recommendations as prescribed by TM 38-75.

2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Engineer Equipment).

b. For other record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

3. Description

A general description of the Portable Jaw Crusher, the location and description of the identification and instruction plates, and information on the differences in models are contained in the Operator and Organizational Maintenance Manual. The repair and maintenance instructions are described in appropriate sections of this manual.

crushed (based on
material weight of
100 lbs. per cubic
foot)

4. Tabulated Data

a. *General.* This paragraph contains all the

c. *Engine.*

Manufacturer.....	General Motors
Model.....	4031C
Series.....	71
No. of cylinders.....	4
Displacement.....	284 cubic inches
Bore.....	4.25 inches
Stroke.....	5 inches
Compression ratio.....	17:2
Firing order.....	1-3-4-2

Length conveyor.....	23 feet
Belt length—52 feet	
Bearings	
Head pulley.....	Flange type
Tail pulley.....	Pillow block type
Toughing roll assembly.....	Three roll type
Diameter.....	4 inches
Bearings.....	Sealed ball bearings
Retrun roll assembly.....	Single roll type
Diameter.....	4 inches
Bearings.....	Sealed ball bearing
Snub roll.....	Disc type
Diameter.....	6 and 8 inches
Bearings.....	Flange type—both snub rolls
Head pulley.....	12 inch dia, solid, lagged
Tail pulley.....	10 inch dia, wing

e. Feeder.

Type.....	Reciprocating plate
Inside width (feeder plate).	21-3/4 inches

Grizzly opening.....	17 1/2 inches nominal
Clutch.....	Twin Disc Model CL208
Grizzly Length.....	18-1/4 inches

f. Crusher.

Type.....	Overhead eccentric jaw
Size.....	15 inches x 24 inches
Drive.....	V-Belt
RPM.....	300
Bearings.....	Roller, self-aligning
Pitman.....	One piece electric cast steel
Jaws.....	Manganese steel reversible
Key plates.....	Manganese steel reversible

g. Standard Engine Nut and Bolt To Data.

Size Nut or Bolt	Torque lb-ft	Size Nut or Bolt	Torque lb-ft	Size Nut or Bolt	Torque lb-ft
1/4-20.....	7-9	7/16-20.....	57-61	3/4-10.....	240-250
1/4-28.....	8-10	1/2-13.....	71-75	3/4-16.....	290-300
5/16-18.....	13-17	1/2-20.....	83-93	7/8-9.....	410-420
5/16-24.....	15-19	9/16-12.....	90-100	7/8-14.....	475-485
3/8-16.....	30-35	9/16-18.....	107-117	1-8.....	580-590
3/8-24.....	35-39	5/8-11.....	137-147	1-14.....	685-695
7/16-14.....	46-50	5/8-18.....	168-178		

h. Specific Engine Nut and Bolt Torque Data.

Cylinder Block

Hand Hole Cover.....	3/8-16.....	10-15 ft-lb
Main Bearing Bolt (Boring).....	5/8-11.....	165-175 ft-lb
Main Bearing Bolt (Assembly).....	5/8-11.....	180-190 ft-lb
Main Bearing Nut (Boring).....	5/8-18.....	140-155 ft-lb
Main Bearing Nut (Assembly).....	5/8-18.....	155-185 ft-lb
Cylinder Head Stud.....		75 ft-lb
Main Bearing Stud.....		35-75 ft-lb

Cylinder Head

Cam Follower Guide Bolt.....	1/4-20.....	12-15 ft-lb
Injector Control Shaft Bracket Bolt.....	1/4-20.....	10-12 ft-lb
Injector Clamp Bolt.....	3/8-16.....	20-25 ft-lb
Injector Clamp Nut.....	3/8-24.....	20-25 ft-lb
Exhaust Manifold Outlet Flange Nuts (Brass).....	3/8-24.....	20-25 ft-lb

Flywheel and Flywheel Housing		
Flywheel Bolts.....	9/16-18.....	150-160 ft-lb
Oil Pan Bolts.....	5/16-18.....	10-12 ft-lb
Flywheel Housing Bolts.....	3/8-16.....	25-30 ft-lb
Idle Gear Hub and Spacer.....	3/8-16.....	40-45 ft-lb
Idle Gear Hub and Spacer.....	3/8-16.....	25-40 ft-lb
Flywheel Housing Bolts.....	3/8-24.....	25-30 ft-lb
Lifter Bracket Bolts.....	7/16-14.....	55-60 ft-lb
Flywheel Housing Bolts.....	1/2-18.....	90-100 ft-lb

Piston and Piston Rings

Air Box Cover Bolt.....	3/8-16.....	10-15 ft-lb
Connecting Rod Nut (Lubrite).....	7/16-20.....	60-70 ft-lb
Connecting Rod Nut (Castellated).....	7/16-20.....	65-75 ft-lb

Camshaft and Balance Shaft

Blower Drive Coupling to Gear Hub Bolt.....	5/16-24.....	20-25 ft-lb
Idle Gear Bearing Retainer Bolt.....	5/16-24.....	24-29 ft-lb
Flywheel Housing Bolts.....	3/8-16.....	25-30 ft-lb

Cam and Balancer Shaft End Bearing Bolt.....	3/8-16.....	35-40 ft-lb
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Flywheel Housing to Idle Gear Hub and Spacer (Self Locking Bolt only).....	3/8-16.....	40-45 ft-lb
--	-------------	-------------

Flywheel Housing to Idle Gear Hub and Spacer (Wired Bolt only).....	3/8-16.....	25-30 ft-lb
---	-------------	-------------

Balance Weight Cover Bolt.....	3/8-16 and 24.....	25-30 ft-lb
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Camshaft Intermediate Bearing Lock Screw.....	3/8-24.....	15-20 ft-lb
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Balance Weight to Hub Bolt.....	3/8-24.....	25-30 ft-lb
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Blower Drive Gear Hub Bearing Support Bolts & Nuts.....	3/8-24.....	25-30 ft-lb
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Balance Weight to Timing Gear Bolt.....		
Generator Drive Bearing Retaining Bolt.....	3/8-24.....	25-30 ft-lb

Generator Drive Oil Seal Retaining Bolt.....	7/16-14.....	30-35 ft-lb
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Tachometer Drive Cover Bolt.....	7/16-14.....	30-35 ft-lb
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Generator Drive Bearing Retaining Bolt.....	1/2-18.....	30-35 ft-lb
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Generator Drive Oil Seal Retaining Bolt.....	1/2-18.....	30-35 ft-lb
--	-------------	-------------

Tachometer Drive Cover Bolt.....	1/2-18.....	30-35 ft-lb
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Rocker Shaft Bolt.....	1/2-18.....	90-100 ft-lb
------------------------	-------------	--------------

Idle Gear and Dummy Hub Bolt.....	1/2-18.....	80-90 ft-lb
-----------------------------------	-------------	-------------

Blower Rotor Gear Retaining Nut.....	1/2-20.....	55-65 ft-lb
--------------------------------------	-------------	-------------

Crankshaft End Bolt.....	1-14.....	290-310 ft-lb
--------------------------	-----------	---------------

Camshaft and Balancer Shaft Nut.....	1 1/8-18.....	300-325 ft-lb
--------------------------------------	---------------	---------------

Blower Drive Gear Hub Nut.....	1 1/2-16.....	50-60 ft-lb
--------------------------------	---------------	-------------

Fuel System

Injector Clamp Stud.....	3/8-16.....	10-25 ft-lb
--------------------------	-------------	-------------

Injector Clamp Bolt.....	3/8-16.....	20-25 ft-lb
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Injector Clamp Nut.....	3/8-24.....	20-25 ft-lb
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Fuel Pipe Nut.....	3/8-24.....	12-15 ft-lb
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Rocket Arm Bracket Bolt.....	1/2-18.....	90-100 ft-lb
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Injector Filter Cap.....	5/8-24.....	65-70 ft-lb
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Blower Drive Hub-to-Blower Rotor Gear Bolt.....	5/16-24.....	25-30 ft-lb
Air Inlet Housing-to-Blower Housing Bolt.....	3/8-16.....	16-20 ft-lb
Blower Housing-to-Cylinder Block Bolt.....	7/16-14.....	55-60 ft-lb
Blower Rotor Timing Gear Bolt.....	7/16-20.....	55-60 ft-lb
Blower Rotor Timing Gear Bolt.....	1/2-20.....	55-65 ft-lb
Lubrication System		
Oil Pan Bolts.....	5/16-18.....	10-12 ft-lb
Oil Pump-to-Bearing Cap Bolt.....	3/8-24.....	25-30 ft-lb
Oil Pump Drive Idler Gear Nut (Marsden).....	1/2-20.....	60-70 ft-lb
Oil Pan Drain Plug.....	18 m.m.....	35-40 ft-lb
Power Take-Off		
Clutch Drive Shaft Nut.....	1 3/4-10.....	225-230 ft-lb
Clutch Driving Ring Bolt.....	1/2-13.....	71-75 ft-lb
Clutch Housing Bolt.....	7/16-14 x 1 1/4.....	48-50 ft-lb

i. *Repair and Replacement Standards.* tolerances, desired clearances, and ma
Tables 1 and 2 lists manufacturer's sizes, allowable wear and clearances.

Table 1. Engine Repair and Replacement Standards

Components	Manufacturer's Dimensions and Tolerances in Inches		Desired Clearance		M A V C
	Min.	Max.	Min.	Max.	
Cylinder Head					
Flatness (Transverse)	-----	-----	-----	-----	
Flatness (Longitudinally)	-----	-----	-----	-----	
Distance Between Top Deck and Fire Deck	3.5560	3.5680	-----	-----	8
Water Nozzles	0.03125 recessed	flush	-----	-----	-----
Cam Follower Boxes	-----	-----	1.0620	1.0630	1
Exhaust Valve Seat Inserts					
Seat Width (90°)	0.0625	0.09375	-----	-----	0
Valve Seat Runout	-----	0.0020	-----	-----	0
Exhaust Valves					
Stem Diameter	0.3417	0.3425	-----	-----	0
Valve Head to Cylinder Head	0.0020	0.0280	-----	-----	1
	recessed	protrusion			
Valve Guides					
Height Above Cylinder Head	1.59375	1.59375	-----	-----	1
Diameter (Inside)	0.3445	0.3445	-----	-----	0
Clearance—Stem to Guide	-----	-----	0.0020	0.0038	0
Rocker Arms and Shafts					
Rocker Shaft Bushing	0.8785	0.8740	-----	-----	-----
Rocker Arm Shaft Bushing Inside Diameter	0.8750	0.8760	-----	-----	-----
Clearance—Shaft to Bushing					

	Tolerances in Inches		Clearance		Wear and Clearance
	Min.	Max.	Min.	Max.	
Crankshaft					
Journal Diameter—Main Bearing	3.499	3.500	-----	-----	-----
Journal Diameter—Connecting Rod	2.749	2.750	-----	-----	-----
Journal Out-of-Round	-----	0.00025	-----	-----	0.0010
Journal Taper	-----	0.0005	-----	-----	0.0015
Runout on Journals					
No. 2 and No. 4 Journals	-----	0.002	-----	-----	-----
No. 3 Journal	-----	0.004	-----	-----	-----
Thrust Washer, Thickness	0.1205	0.1220	-----	-----	-----
End Thrust Clearance (End Play)	-----	-----	0.0040	0.0110	0.0180
Main Bearings					
Bearing Inside Diameter (Vertical Axis)	3.5014	3.5034	-----	-----	-----
Clearance—Bearing to Journal	-----	-----	0.0014	0.0044	0.0060
Bearing Thickness—90° From Parting Line	0.1548	0.1553	-----	-----	0.1530 (min.)
Connecting Rod Bearings					
Inside Diameter (Vertical Axis)	2.7514	2.7534	-----	-----	-----
Clearance—Bearing to Crankshaft Journal	-----	-----	0.0014	0.0044	0.0060
Bearing Thickness—90° from Parting Line	0.1548	0.1553	-----	-----	0.1530 (min.)
Cylinder Block					
Main Bearing Bore—Inside Diameter (Vertical Axis)	3.812	3.8130	-----	-----	-----
Block Bore					
Diameter	4.6265	4.6275	-----	-----	-----
Out-of-Round	-----	0.0010	-----	-----	0.0030
Taper	-----	0.0010	-----	-----	0.0020
Cylinder Liner Counterbore					
Diameter	5.0460	5.0485	-----	-----	-----
Depth	0.4785	0.4795	-----	-----	-----
Cylinder Liners					
Outside Diameter	4.6250	4.6260	-----	-----	-----
Inside Diameter	4.2495	4.2511	-----	-----	-----
Clearance—Liner to Block Bore	-----	-----	0.0005	0.0025	0.0030
Out-of-Round—Liner Inside Diameter	-----	0.0020	-----	-----	0.0030
Taper—Liner Inside Diameter	-----	0.0010	-----	-----	0.0020
Depth of Liner Flange BELOW High Block	0.0465	0.0500	-----	-----	0.0500
Height of Liner ABOVE Low Block	0.0020	0.0060	-----	-----	0.0060
Variation in Height Between Adjacent Liners	-----	0.0020	-----	-----	0.0020
Pistons and Rings					
Piston:					
Height (Centerline of Bushing to Top of Piston)	3.5130	3.5180	-----	-----	-----
Diameter:					
At Top	4.2190	4.2220	-----	-----	-----
At Skirt (Below Compression Ring Grooves to Bottom)	4.2433	4.2455	-----	-----	-----
Clearance—Piston Skirt to Line	-----	-----	0.0040	0.0078	0.0120

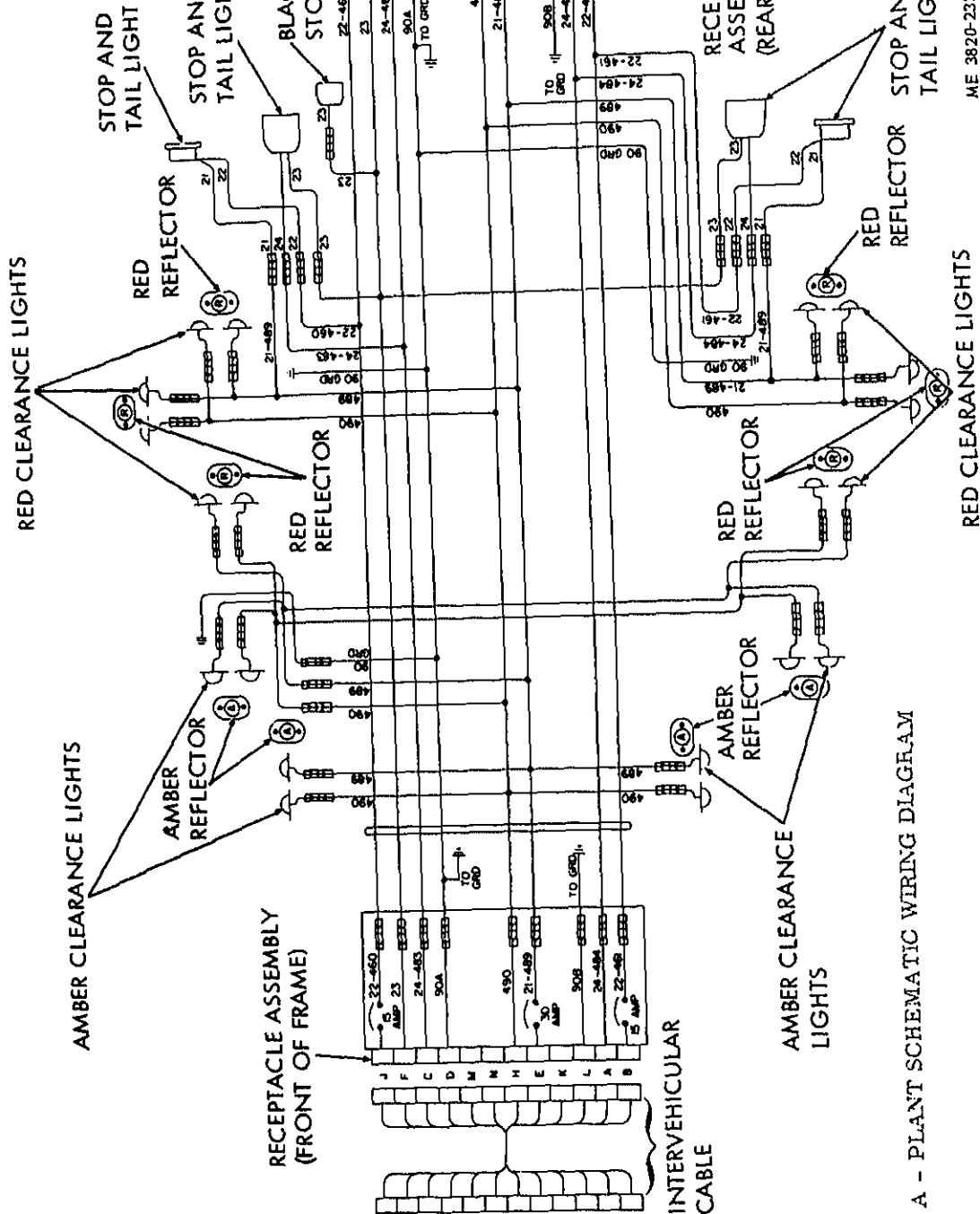
Piston Pins					
Diameter	1.4996	1.5000			
Pin-to-Piston Bushing Clearance	-----	-----	0.0025	0.0034	0
Pin-to-Rod Bushing Clearance	-----	-----	0.0015	0.0024	0
Length	3.6050	3.6200	-----	-----	-----
Pin-to-Retainer End Clearance	-----	-----	0.0160	0.0640	0
Piston Pin Bushings					
Inside Diameter	1.5025	1.5030	-----	-----	1
Connecting Rod					
Inside Diameter Upper Bushing	1.5015	1.5020	-----	-----	1
Normal Rod Side Clearance	-----	-----	0.0060	0.0120	-----
Camshaft					
Shaft Diameter—At Bearings					
Front and Rear	1.4970	1.4975	-----	-----	-----
Center and Intermediate	1.4980	1.4985	-----	-----	-----
Shaft Diameter—At Gear	1.1875	1.1880	-----	-----	-----
Length—Thrust Bearing End Journal	2.8740	2.8760	-----	-----	-----
End Thrust	0.0040	0.0120	-----	-----	0
Thrust Washer Thickness	0.1200	0.1220	-----	-----	-----
Balance Shaft					
Shaft Diameter at Bearing	1.4970	1.4975	-----	-----	-----
Shaft Diameter at Gear	1.1875	1.1880	-----	-----	-----
Length—Thrust Bearing	2.8740	2.8760	-----	-----	-----
End Thrust	0.0040	0.0120	-----	-----	0
Thrust Washer Thickness	0.1200	0.1220	-----	-----	-----
Camshaft and Balance Shaft Bearings					
Inside Diameter					
Front and Rear	1.5000	1.5010	-----	-----	-----
Center and Intermediate	1.5010	1.5030	-----	-----	-----
Clearance—Bearings-to-Shaft					
Front and Rear (Next to Flange)	-----	-----	0.0025	0.0040	0
Center and Intermediate	-----	-----	0.0025	0.0050	0
Outside Diameter of Bearings					
Front and Rear	2.1880	2.1885	-----	-----	-----
Intermediate	2.1840	2.1860	-----	-----	-----
Diameter of Block Bore	2.1875	2.1885	-----	-----	-----
Clearance—Bearings-to-Block					
Front and Rear	-----	-----	0.001	0.0005	-----
			Press	Loose	-----
Intermediate	-----	-----	0.0015	0.0045	-----
Camshaft and Balance Shaft Gears					
Backlash	0.0030	0.0080	-----	-----	0
Gear Inside Diameter	1.1865	1.1875	-----	-----	-----
Clearance—Gear-to-Shaft	-----	-----	0.0015	0.0000	-----
			Press		-----
Idle Gear					
Backlash	0.0030	0.0080	-----	-----	0
Preload—Variation on pull 2 lbs.-11 oz.	1/2 lb.	6 3/4	-----	-----	1
		lbs.			

Components	Dimensions and Tolerances in Inches		Desired Clearance		Allowable Wear and Clearance
	Min.	Max.	Min.	Max.	
Gear Inside Diameter	4.7490	4.7500	-----	-----	-----
Clearance—Gear-to-Crankshaft	-----	-----	0.001 Press	0.001 Loose	-----
Blower Drive Gear					
Backlash	0.0030	0.0080	-----	-----	0.010
Gear-to-Hub Fit	0.0005 Press	0.0010 Loose	-----	-----	-----
Support-to-End Plate	0.0005 Press	0.0025 Loose	-----	-----	-----
Support Bushing Inside Diameter	1.6260	1.6265	-----	-----	-----
Hub Diameter—At Bushing	1.6240	1.6250	-----	-----	-----
Hub-to-Support Bushing Clearance	-----	-----	0.0010	0.0025	0.0050
Hub-to-Cam Clearance	-----	-----	0.0020	0.0070	-----
End Thrust	0.0050	0.0080	-----	-----	0.0100
Blower					
Backlash—Timing Gears	0.0005	0.0025	-----	-----	0.004
Oil Seal (Below End Plate Surface)	0.002	0.008	-----	-----	-----
Pin-Dowel (Projection Beyond Inside Face of End Plates)	0.380	-----	-----	-----	-----
Clearances—					
Rotor to End Plate—Gear End	-----	-----	0.007	-----	-----
Rotor to End Plate—Front End	-----	-----	0.009	-----	-----
Rotor to Housing—Inlet Side	-----	-----	0.015	-----	-----
Rotor to Housing—Outlet Side	-----	-----	0.004	-----	-----
Trailing Edge of Upper Rotor to Leading Edge of Lower Rotor	-----	-----	0.002	0.006	0.006
Leading Edge of Upper Rotor to Trailing Edge of Lower Rotor	-----	-----	0.012	-----	-----

Table 2. Primary Jaw Crusher Plant Repair Replacement Standards

Components	Manufacturer's Dimensions and Tolerances in Inches		Desired Clearance		Maximum Allowable Wear and Clearance
	Min.	Max.	Min.	Max.	
Jaw Crusher					
Clearance—Pitman Bearing (Outer Race to Roller)	-----	-----	0.0025	0.006	-----
Clearance—Pitman Bearing Seal	-----	-----	0.010	-----	-----
Mounted Clearance—Side Bearing (Outer Race to Roller)	-----	-----	0.008	0.005	-----
Clearance—Side Bearing Seal	-----	-----	0.010	-----	-----

j. Schematic Wiring Diagram. Figure 1 shows the schematic wiring diagram for the Portable Jaw Crusher Plant.

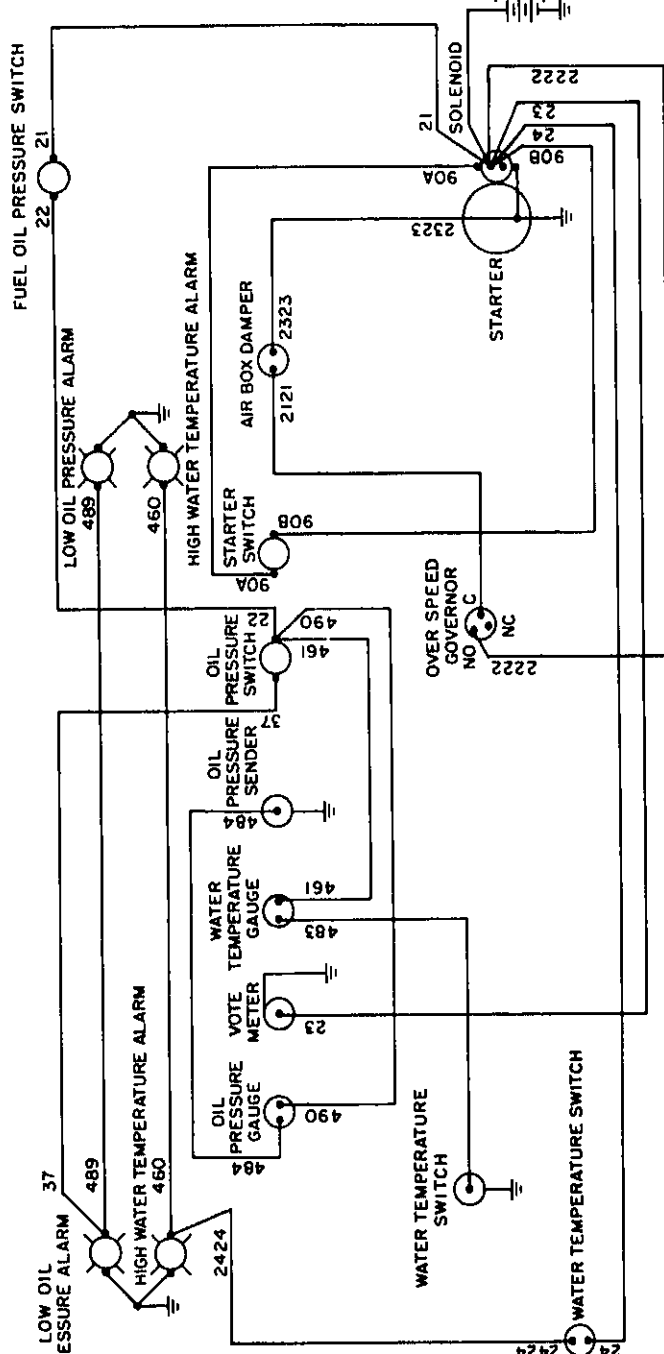


A - PLANT SCHEMATIC WIRING DIAGRAM

RED CLEARANCE LIGHTS

STOP AND TAIL LIGHT

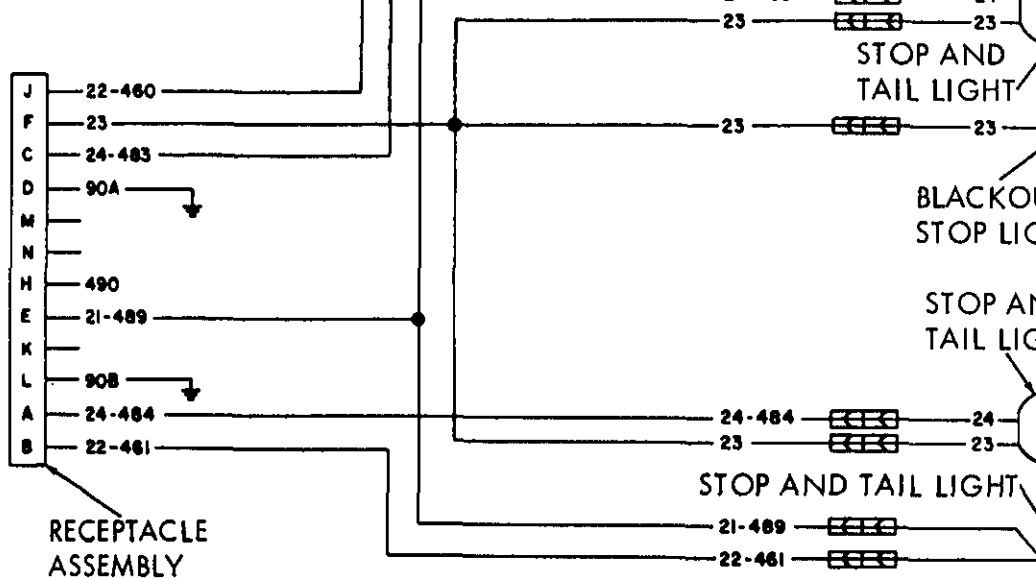
ME 3820-233



NOTE: GENERATOR AND REGULATOR NOT SHOWN

B - POWER UNIT SCHEMATIC WIRING DIAGRAM.

ME 3820-233-35-



C - FRONT DOLLY SCHEMATIC WIRING DIAGRAM

ME 3820-233-35-1

Figure 1 (3). Continued.

CHAPTER 2

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5. Special Tools and Equipment

The special tools required to perform direct and general support and depot maintenance on the Portable Jaw Crusher are listed in Table 3 and the applicable appendix of this

manual. References and illustrations indicating the use of these tools are listed in the table. No special equipment is required by direct and general support and depot maintenance personnel for performing maintenance on the Portable Jaw Crusher.

Table 3. Special Tools

Item	Part No.		Ref.		Use
			Fig.	Para.	
Wrench	(31245)	45500-751-09	32-11	59	Side bearing removal and installation
Removal nut	(31245)	697BA	32-11	59	Side bearing removal
Tightening nut	(31245)	697-01	32-26	59	Side bearing installation
Wrench	(31245)	45500-752-20	32-10	59	Sleeve lock nut removal and installation
Wrench	(31245)	45500-752-23	32-9	59	Side bearing lock nut removal and installation

6. Direct and General Support and Depot Maintenance Repair Parts

Direct and General Support and Depot Maintenance Repair Parts are listed and illustrated in TM 5-3820-235-85P.

7. Specially Designed Tools and Equipment

No specially designed tools and equipment are required.

Section II. TROUBLESHOOTING

8. General

This section provides information useful in

9. Erratic Engine Operation

Probable Cause

Possible Remedy

10. Engine Lacks Power

Probable Cause	Possible Remedy
Piston assemblies worn	Replace piston assemblies (para 45)
High engine temperature caused by defective water pump	Repair defective water pump (para 33)
Improper gear train timing	Time gear train (para 50)

11. Engine will not Turn

Probable Cause	Possible Remedy
Engine is locked or seized	Disassemble engine to determine the cause and replace necessary parts

12. Low Cranking Speed

Probable Cause	Possible Remedy
Starter brush springs weak	Check brush spring tension, replace springs if necessary (para 29)
Starter commutator dirty or worn	Polish commutator, machine commutator and under-cut mica if necessary (para 29)
Starter armature burned out	Replace armature (para 29)

13. Engine Hard to Start

Probable Cause	Possible Remedy
Exhaust valves ticking or burned	Check for bent valve guide and replace if necessary (para 42) Check for defective valve spring and replace if necessary (para 42) Clean and reface valve (para 42)
Compression rings worn or broken	Replace rings (para 45)
Cylinder head gasket leaking	Replace gasket (para 42)
Improper valve clearance	Check exhaust valve clearance and adjust to the correct

Worn fuel pump gears or pump housing

Fuel pump not rotating

tips (para 40)

Replace injector plun and bushing assem (para 40)

Time injector rack and gear (Operator's Manual)

Replace gear and shaft assembly in pump body (para 35)

Check blower drive, if broken, replace necessary parts (para 36)

Check fuel pump drive gear and shaft, if broken, replace necessary parts (para 35)

Replace fuel pump (Operator's Manual)

14. Low Oil Pressure

Probable Cause	Possible Remedy
Poor circulation	Remove and clean oil cooler core (Operator's Manual) Replace oil cooler bypass valve (Operator's Manual) Replace oil pressure regulator valve (Operator's Manual) Check if gallery, crankshaft or camshaft plugs are missing & replace if parts are missing.
Faulty oil pump	Replace oil pump (para 44)
Dirty oil pump inlet screen	Clean screen (para 44)

15. Engine Overheats

Probable Cause	Possible Remedy
Improper engine lubrication	Check for proper operation of engine oil pump (para 44)

17. Feeder Clutch Slips

Probable Cause	Possible Remedy
Worn driving plates friction surfaces	Adjust clutch (Operator's Manual) Replace driving plates

18. Side and Pitman Bearings Overheat

Probable Cause	Possible Remedy
Excessive or insufficient lubricant	Refer to the Operator's Manual
Plant out of level	Level plant (Operator's Manual)
Worn toggle plate	Replace toggle plate (para 60)
Flywheels loose	Tighten flywheel against the seal
Bearing failure	Replace bearings (para 59)
Insufficient radial clearance between side bearing end cap and seal	Place wedge between pitman and bearing housing and drive at base of side bearing housing until a 0.010 inch seal clearance is obtained. Tighten the housing to base capcrews (para 59)

19. Excessive Jaw Wear

Probable Cause	Possible Remedy
Stationary jaw loose	Tighten jaw (para 59)
Incorrect crusher discharge opening	Adjust crusher discharge opening (Operator's Manual)

Troughing roll assembly not positioned correctly in frame

Move one end of troughing roll assembly to change belt travel to center on troughing roll assembly. Refer to Operator's Manual

Spillage of material

Adjust flashing to eliminate spillage
Level complete plant

Plant operating in unlevel position

Troughing and return roller not rotating

Free rolls or replace defective rolls if necessary

Head or tail pulley moved

Center pulley and securely lock into position with the taper lock bushings

22. Conveyor Belt Slipping

Probable Cause	Possible Remedy
Insufficient conveyor belt tension	Tighten conveyor belt. Refer to Operator's Manual
Drive pulley lagging worn	Replace lagging. Refer to Operator's Manual
Troughing or return roll assemblies not rotating freely	Free roll assemblies or replace if necessary
Insufficient V-belt drive tension	Check drive and tighten V-belts if necessary

Section III. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

23. General

The power unit, feeder, delivery conveyor, and jaw crusher should be removed for high level maintenance and overhaul. The removal and installation of these components are discussed in this section.

The power unit and feeder, along with those

- Crusher-to-feeder countershaft drive
- Feeder countershaft drive guard.
- Flywheels, rim sheave, and pulley.
- Walkway railing above crusher.
- Crusher hopper and walkway platform.
- Crusher flywheel guards.
- Conveyor countershaft drive guard.

- (1) Disconnect fuel lines from the power unit (Operator's Manual).
- (2) Disconnect the battery cables.
- (3) Refer to figure 2 and remove the power unit.

b. Installation

- (1) Refer to figure 2 and install the power unit.
- (2) Install the V-belts and adjust for proper belt tension (Operator's Manual).

Note. When making the belt tension adjustment be sure the power unit clutch drive shaft is parallel with the jaw crusher eccentric shaft.

- (3) Connect battery cables.

Note. Connect negative (-) battery cable last.

- (4) Connect fuel lines (Operator's Manual).
- (5) Connect clutch control universal joint (fig. 2).

25. Reciprocating Feeder

a. Removal

- (1) Remove countershaft drive rear guard (Operator's Manual).
- (2) Remove feeder drive belts (Operator's Manual).
- (3) Refer to figure 3 and remove the feeder and hopper complete with feeder drive.

b. Installation.

- (1) Refer to figure 3 and install the feeder and hopper complete with feeder drive.
- (2) Install feeder drive belts and adjust for proper belt tension (Operator's Manual).
- (3) Install countershaft drive rear guard (Operator's Manual).

26. Jaw Crusher

a. Removal

- (1) Remove feeder clutch control (Operator's Manual).

- (6) Remove crusher hopper and v platform (Operator's Manual).

- (7) Refer to figure 4 and remove crusher.

b. Installation

- (1) Refer to figure 4 and install crusher.
- (2) Install crusher hopper and v platform (Operator's Manual).
- (3) Install crusher-to-power and crusher-to-feeder countershaft drive belts for proper belt tension (Operator's Manual).
- (4) Install inner belt and inner wheel guards (Operator's Manual).
- (5) Install the crusher guard frame (Operator's Manual).
- (6) Install the front and rear countershaft drive guards (Operator's Manual).
- (7) Install feeder clutch control (Operator's Manual).

27. Delivery Conveyor

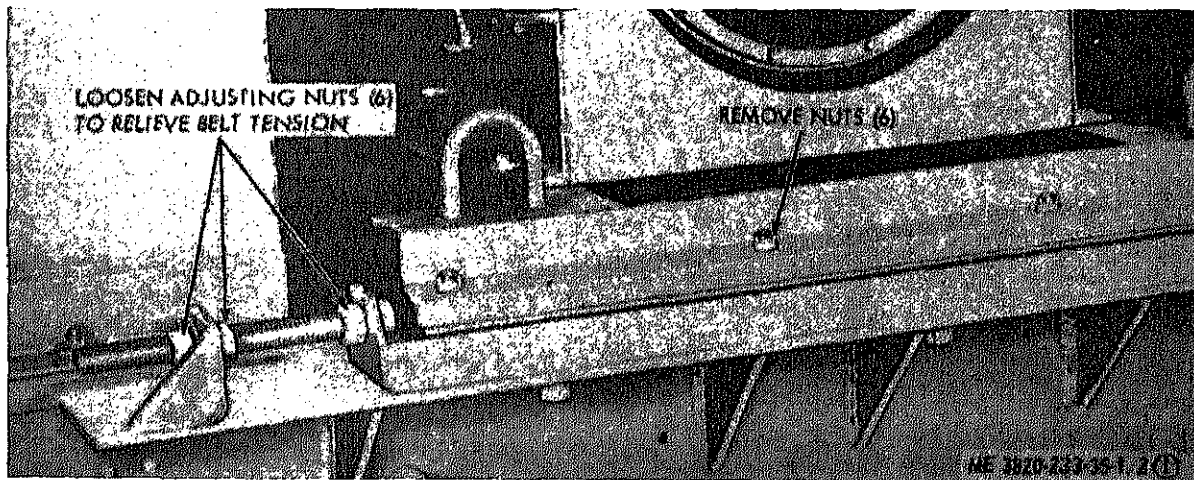
a. Removal

- (1) Remove the front countershaft hand guard frame (Operator's Manual).
- (2) Remove the front countershaft hand guard (Operator's Manual).
- (3) Remove conveyor belt (Operator's Manual).
- (4) Refer to figure 5 and remove speed reducer and conveyor head frame.
- (5) Disconnect conveyor tail frame from the conveyor center support shown on figure 2.

- (6) Refer to figure 6 and remove conveyor tail frame.

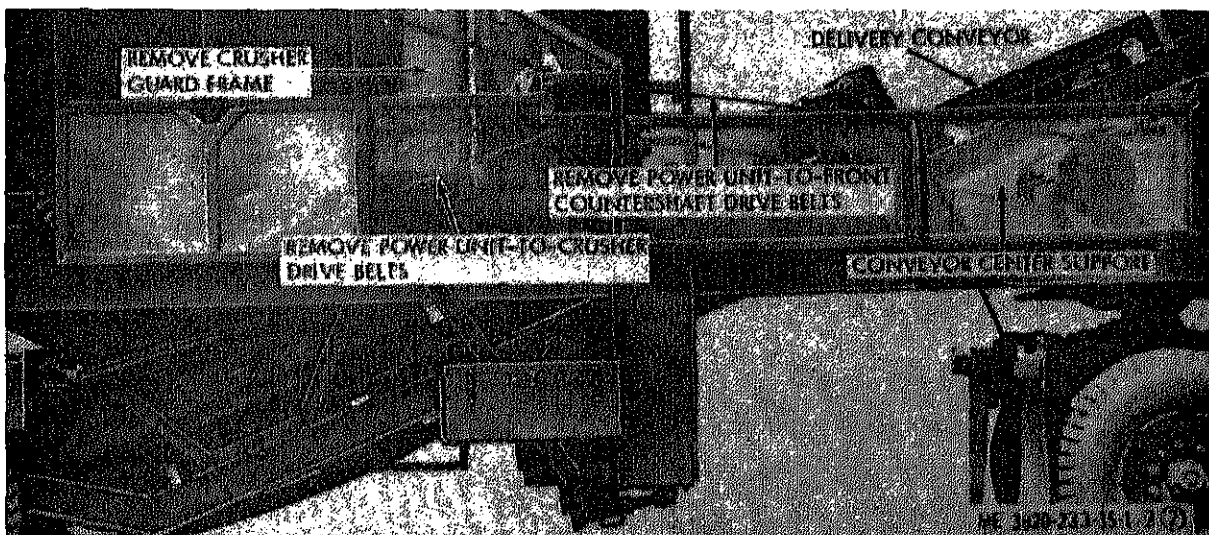
- (7) Remove conveyor hopper from crusher base as shown on figure 4.

b. Installation



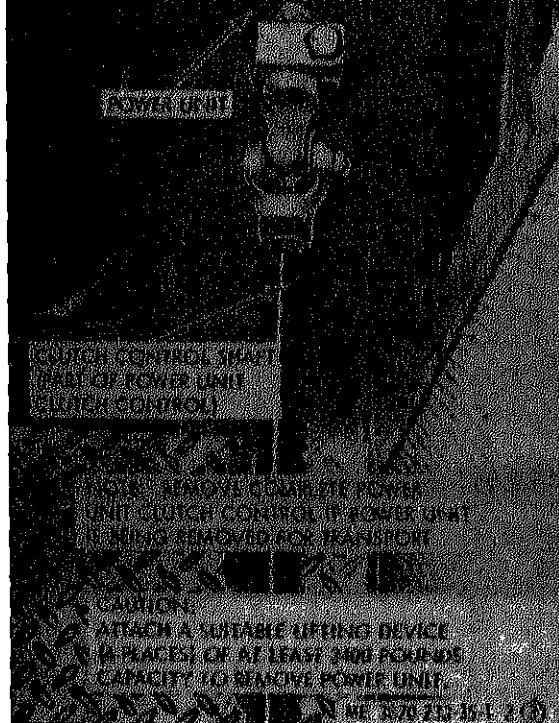
STEP 1. DISCONNECT POWER UNIT FROM FRAME.

Figure 2 (1). Power unit, removal and installation.



STEP 2. REMOVE GUARD AND DRIVE BELTS.

Figure 2 (2). Continued.

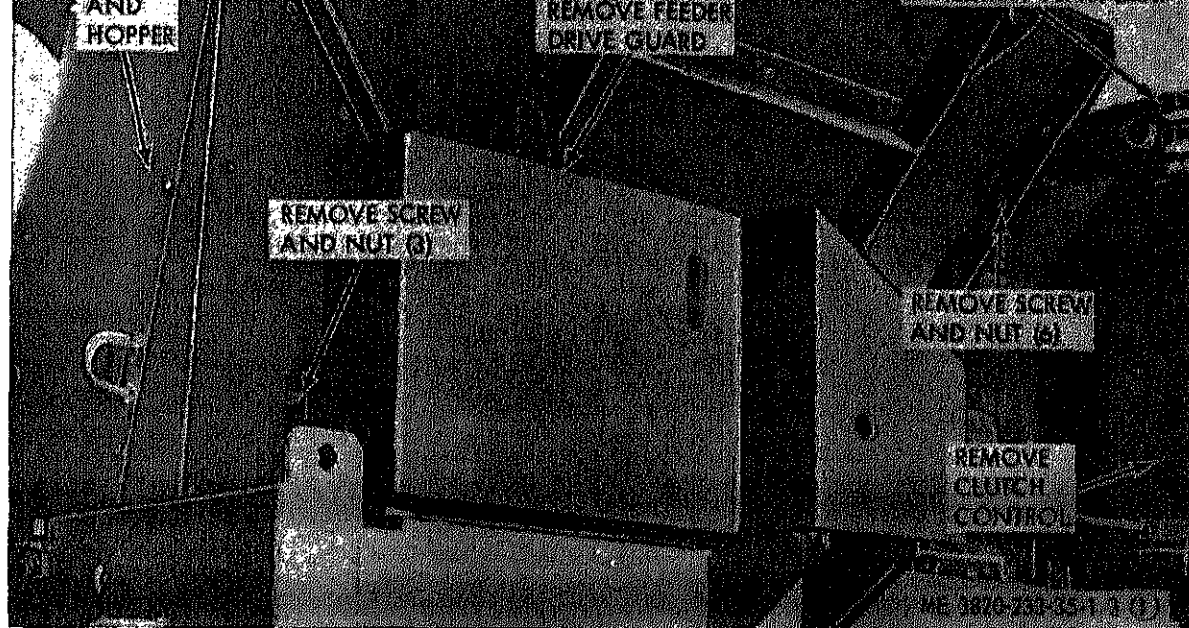


CAUTION. ATTACH A SUITABLE LIFTING
DEVICE (4 PLACES) OF AT LEAST
3400 POUNDS CAPACITY TO REMOVE
POWER UNIT.

STEP 3. DISCONNECT CLUTCH CONTROL
SHAFT.

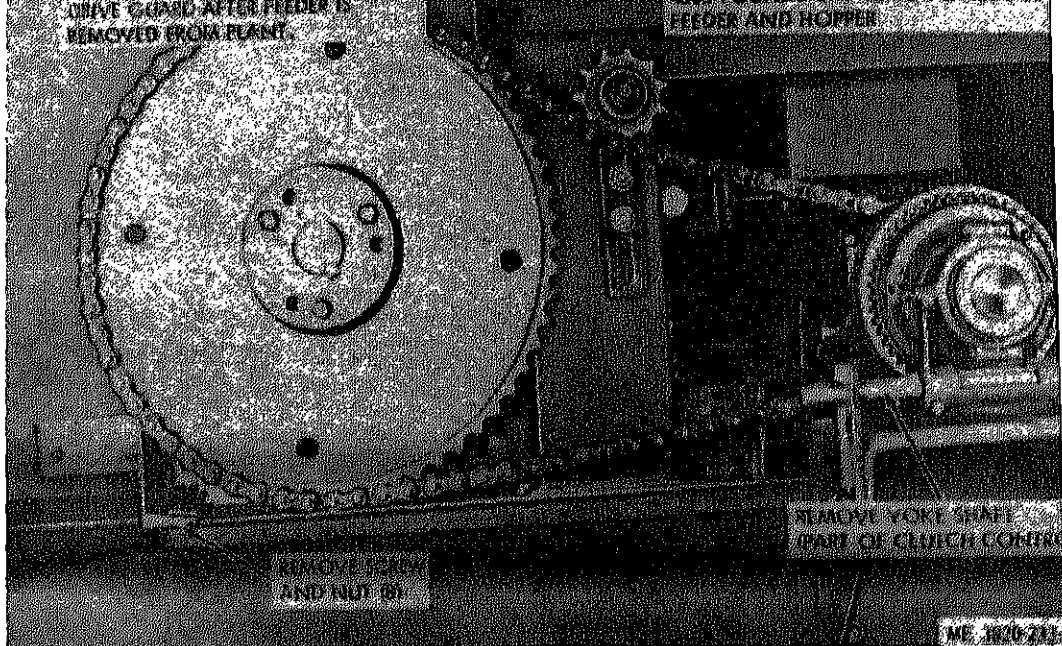
STEP 4. REMOVE POWER UNIT

Figure 2 (5). Continued.



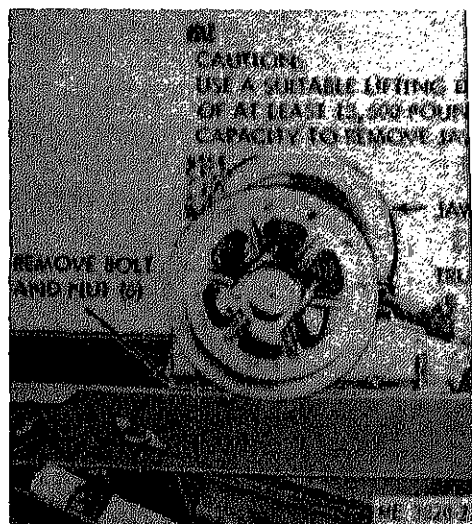
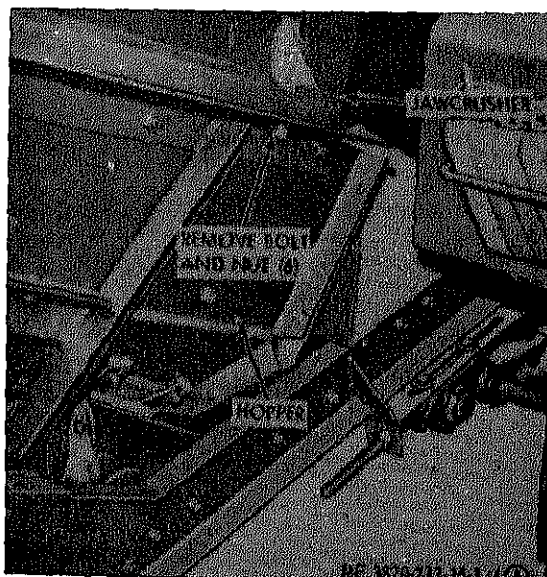
**STEP 1. DISCONNECT FEEDER DRIVE GUARD
AND WALKWAY PLATFORM FROM
FEEDER AND HOPPER.**

Figure 3 (1). Feeder and feeder hopper, removal and installation.



STEP 2. REMOVE FEEDER AND HOPPER COMPLETE WITH FEEDER DRIVE.

Figure 3 (2). Continued.



CAUTION: USE A SUITABLE LIFTING

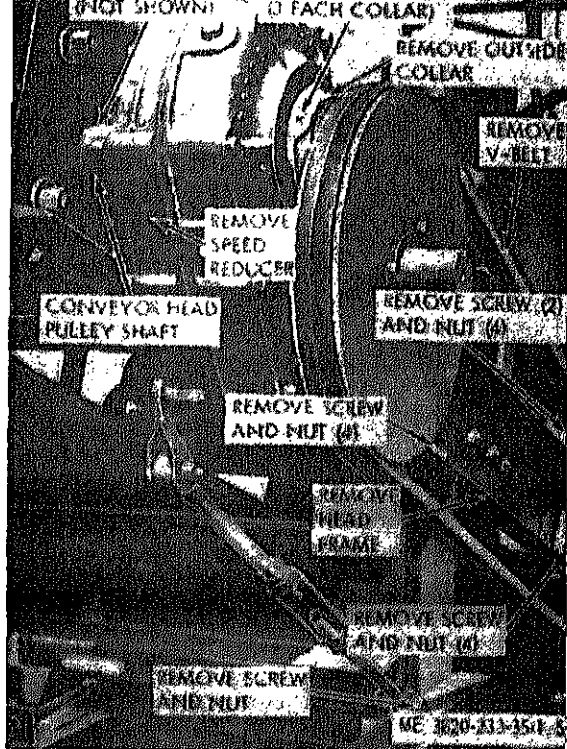
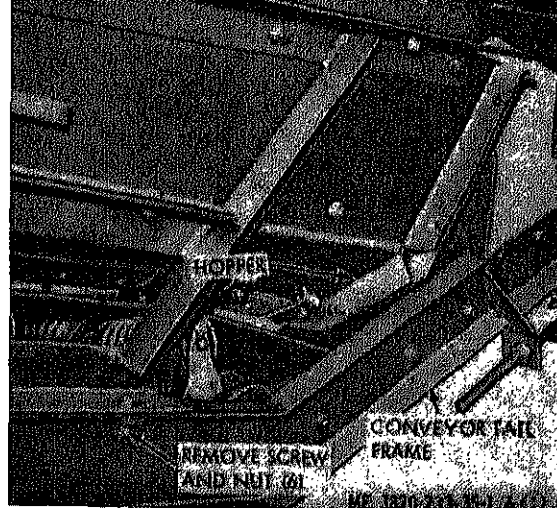
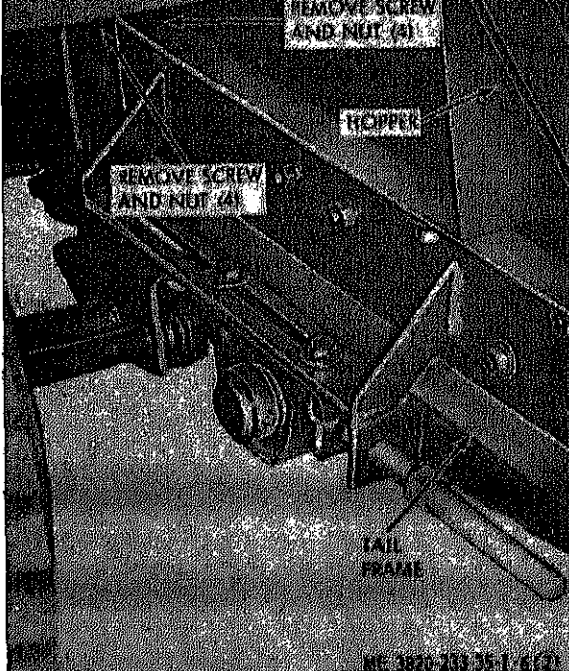


Figure 5. Speed reducer and conveyor head frame, removal and installation.



STEP 1. DISCONNECT HOPPER FROM CONVEYOR TAIL FRAME.

Figure 6 (1). Conveyor tail frame, removal and installation.



**STEP 2. DISCONNECT CONVEYOR TAIL
FRAME FROM HOPPER AND TRUCK
FRAME.**

STEP 3. REMOVE CONVEYOR TAIL FRAME.

Figure 6 (2). Continued.

CHAPTER 3

ENGINE REPAIR INSTRUCTIONS

Section I. ENGINE ACCESSORIES

28. General

This section contains those items which are considered accessories to the engine. They consist of the starter, battery-charging generator, radiator, water pump, hydraulic governor, fuel pump, blower drive, and overspeed governor.

29. Starter

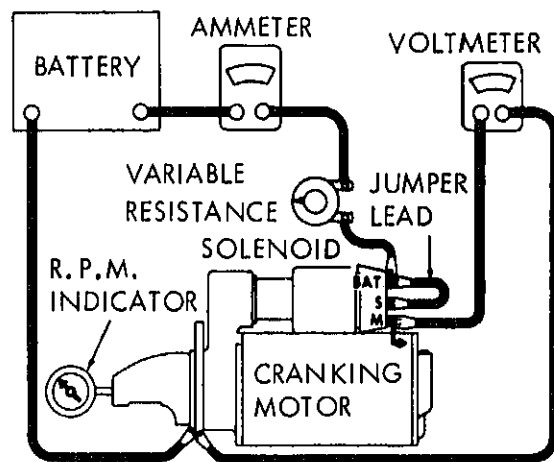
a. General. The starter is a 24 volt, 1-brush, gear drive type. The starter converts the electrical energy of the batteries into the mechanical energy necessary to crank the engine. The starter incorporates an overrunning clutch which shifts the starting motor pinion into mesh with the flywheel ring gear.

b. Removal. Refer to Operator's Manual.

c. Bench Testing

Note. Never operate the cranking motor more than 30 seconds at a time without pausing to allow it to cool at least two minutes.

(1) The armature should be checked for freedom of operation by turning the drive. Tight, dirty, or worn bearings, bent armature shaft, or loose pole shoe screw will cause the armature to drag and it will not turn freely.



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VOLTS	MIN. AMPS	MAX. AMPS	MIN. R.P.M.	MAX. R.P.M.
23.0	60*	90*	7000	10700

* INCLUDES SOLENOID

Figure 7-1. No load test.

(b) Rated current draw and no-load speed indicates normal condition of the cranking motor.

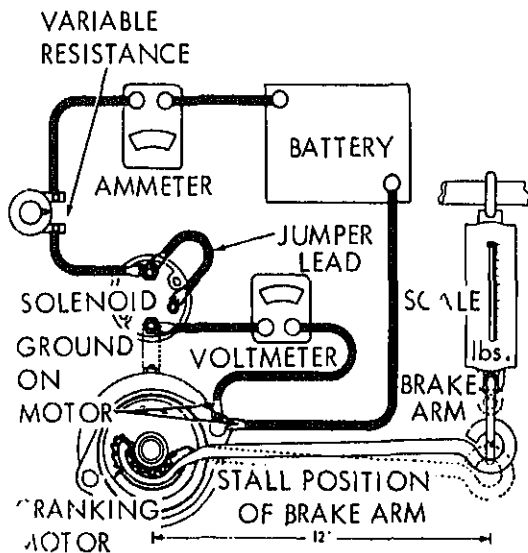
(f) Low no-load speed and low current draw indicate a high internal resistance due to poor connections, defective leads, dirty commutator and causes listed under (e).

(g) High free speed and high current draw indicate shorted fields.

(3) Lock-Torque Test (fig. 7-2). The lock-torque test requires the equipment illustrated. A variable resistance with a high current capacity should be used. The cranking motor should be SECURELY mounted and a brake arm hooked to the drive. When specified current is applied, the torque can be computed from the reading on the scale. A one foot brake arm will directly indicate foot-pound. If the torque is low, the motor must be disassembled for further tests and repair.

d. Disassembly

(1) Scribe marks across drive housing, lever housing, frame and end ball to facilitate reassembly in the correct relationship.



(1) The drive, armature and field should not be cleaned in any degreasing tank or with grease dissolving solvents, since this would dissolve the lubricant in the drive damage the insulation in the armature field coils. All parts except the drive should be cleaned with oleum spirits and a brush. The drive can be wiped with a clean cloth.

(2) If the commutator is dirty it may be cleaned with No. 00 sandpaper. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR.

f. Inspection and Repair

(1) Inspect housings and frames for cracks and distortion. Inspect thread tapped holes for damage. Replace defective parts.

(2) Inspect sleeve bearings for wear. Replace bearing if defective. Check for loose in housing or end bell. Replace worn or defective bearings. If new bearing is loose bore, replace housing or end bell.

(3) Inspect wicks for tests, fraying, wear. Replace if defective.

(4) Turn down commutator if grooved or out of round. Undercut mica to a depth of 0.025 to 0.032 inch below surface of commutator. Do not widen slots when undercutting mica.

(5) Inspect drive pinion for broken or badly worn teeth. Inspect clutch splines for wear and damage. Inspect shell for cracks or broken condition. Check to make sure pinion will drive in one direction and will not drive in opposite direction. Replace drive clutch if defective.

(6) Inspect shift lever, shaft, and solenoid plunger for cracks or distortion. Replace defective parts.

(7) Inspect bellows for tears, punctures and deterioration.

(8) Inspect solenoid plunger for

threads, connect multimeter probes to the ends of field coil, if multimeter does not read field coil is open and should be replaced.

(3) To test field coil windings for grounds, disconnect field coil winding ground connection. Connect meter probes to field frame and field connector, if multimeter reads, field coil is grounded, and must be repaired or replaced.

h. Assembly of End Bell and Brush Holder Plate

(1) If wick was removed during disassembly, saturate a new wick and plug with oil and install in end bell. Wick must not be in fill hole.

(2) Apply sealer to expansion plug hole and install plug. Fill reservoir with oil and install pipe plug.

(3) If bushing was removed, press a new bushing in end bell and install expansion plug.

(4) Assemble brush holder plate and end bell in the reverse order of disassembly but do not install brushes.

i. Starter Assembly

(1) If wicks were removed during disassembly, install wicks and plugs following same instructions specified for end bell ((1) and (2) above.)

(2) If bushings were removed, press new bushings into housings.

(3) Assemble starter in reverse order of disassembly with the following exceptions and additions.

(4) If field windings were removed, coat threads of pole shoes screws with a suitable thread sealer before installation. Varnish inside of frame and winding assembly. Leave .038 inch from each end of frame free of

making sure screws is not stripped.

(6) If new brushes are being installed cover commutator with No. 00 sandpaper temporarily install armature, brushes, and end bell and turn in brushes. Disassemble, remove sandpaper, and clean armature and brush holder plate assembly.

(7) Install thrust washer on armature shaft and install preformed packing on end bell. Install end bell assembly with assembled brush holder assembly on commutator and install brushes. Install flat washer on armature shaft and install armature and end bell as a unit into frame.

j. Adjusting Drive Clutch Pinion Clearance

(1) Remove plug.

(2) With starter pinion in engaged position, press clutch inward lever to take up slack.

(3) Adjust hex self-locking nut until clearance between outer face of pinion and inner face of housing overhaul is $23/64$ inch $\pm 1/32$ inch.

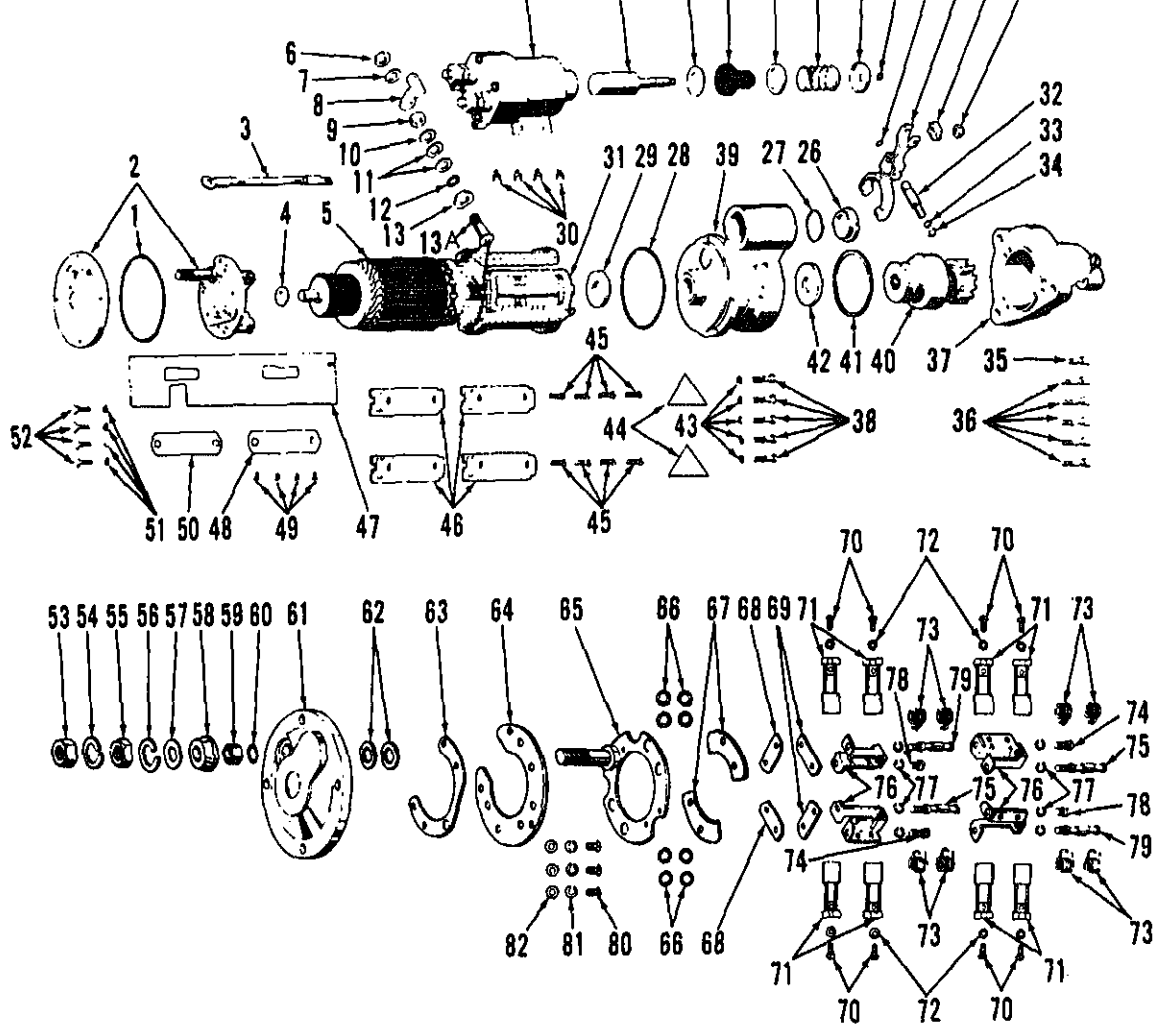
k. Installations. Refer to Operator's Manual

30. Generator-Battery Charging

a. General. The generator is a 24-volt 4 ampere type mounted on the front of the engine. It is fungus and corrosion resistant and is arranged for "B" type circuit with the field grounded inside the generator.

b. Removal. Refer to Operator's Manual.

c. Bench Testing. To check the generator for electrical output, Connect an ammeter in series with a battery to the generator output terminal. Also connect a voltmeter from the generator output terminal to ground, and load rheostat across the battery. Connect



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1 O-ring	13 Bushing	24 Guide	36 Screw
2 Plate assembly	13A Stud	25 Nut	37 Housing
3 Terminal and lead	14 Switch	26 Plug	38 Screw
4 Washer	15 Plunger assembly	27 O-ring	39 Housing
5 Armature	16 Washer	28 O-ring	40 Drive clutch assembly
6 Nut	17 Boot	29 Washer	41 Gasket
7 Lockwasher	18 Retainer	30 Screw and washer	42 Washer
8 Connector	19 Spring	31 Field coil	43 Lockwasher

51 Washer	60 O-ring	69 Plate	78 Screw
52 Screw	61 Frame	70 Screw	79 Holder screw
53 Nut	62 Washer	71 Brush	80 Screw
54 Lockwasher	63 Plate	72 Lockwasher	81 Lockwasher
55 Nut	64 Plate	73 Spring	82 Washer
56 Lockwasher	65 Plate and stub	74 Screw	

Figure 7-3—Continued.

d. *Disassembly.* Refer to figure 8-2 and disassemble the generator.

c. *Cleaning*

(1) Clean the armature and field windings of any dirt or magnetized particles. To remove grease and oil, apply a light coat of a safety type petroleum solvent such as MIL-T-6003, with a brush. Wipe clean, then use compressed air to remove any remaining dirt film. Do not use any degreasing compounds or submerge the armature in a degreasing tank as this would damage the insulation.

(2) Clean the commutator with 00 sandpaper and remove sand particles with compressed air.

(3) Clean the commutator end frame, and components with an approved solvent and dry thoroughly.

Caution: Do not soak insulators.

f. *Inspection and Repair*

(1) Inspect the commutator for roughness, high mica, loose winding, burrs, or pits. Smooth the commutator with 00 sandpaper or undercut on a lathe. Replace the armature if the commutator bars are less than 1/16-inch thick after undercut. Undercut the mica between the bars to a depth of 1/32-inch.

Caution. Do not widen commutator slots by removing metal from bars when undercutting. Use only solder with a rosin core flux.

(2) Inspect the armature shaft for wear, pits, bends, corrosion, or cracks.

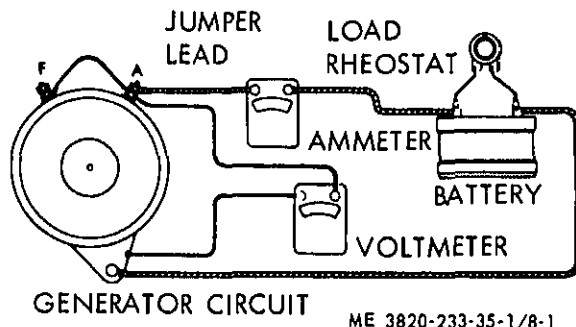


Figure 8-1. Connections for checking output on "B" circuit generators.

(5) Inspect brush plate for cracks and loose rivets. Inspect insulated brush holder for grounds.

(6) Inspect brush springs for tension and signs of breaks or other damage. Replace brushes.

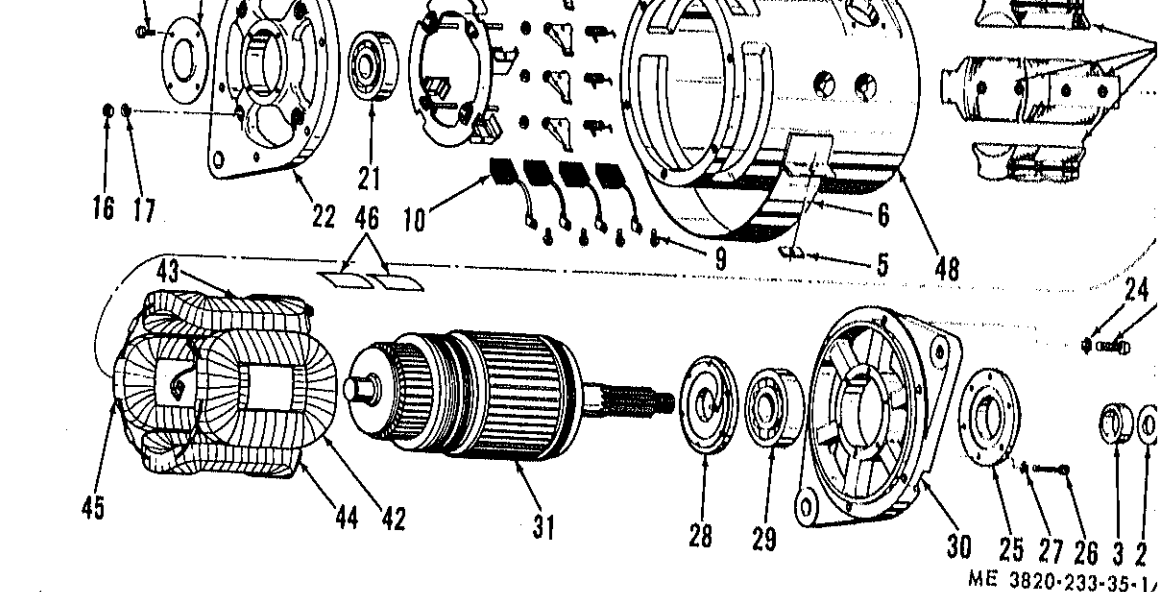
(7) Inspect the ball bearings for smooth operation. Inspect for excessive side play and damaged surfaces.

(8) Inspect the generator field frame for breaks, cracks, and damaged threads.

(9) Inspect all hardware for damaged threads.

b. *Testing*

(1) Inspect for windings grounded to core with a continuity tester. Touch one probe of the tester to the armature shaft and the other to each commutator riser. An indication



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- | | | | |
|--------------------|-------------------|---------------------|-------------------|
| 1 Nut | 13 Arm | 25 Plate | 37 Elbow |
| 2 Washer | 14 Washer | 26 Screw | 38 Screw and wash |
| 3 Collar | 15 Plate assembly | 27 Lockwasher | 39 Spacer |
| 4 Screw | 16 Nut | 28 Plate | 40 Pole shoe |
| 5 Nut | 17 Lockwasher | 29 Bearing | 41 Screw |
| 6 Cover | 18 Screw | 30 Frame | 42 Coil |
| 7 Screw | 19 Screw | 31 Armature | 43 Coil |
| 8 Lockwasher | 20 Plate | 32 Screw | 44 Coil |
| 9 Screw and washer | 21 Bearing | 33 Screw and washer | 45 Coil |
| 10 Brush | 22 Frame | 34 Lead and clip | 46 Insulator |
| 11 Lead assembly | 23 Screw | 35 Lead and clip | 47 Pin |
| 12 Spring | 24 Lockwasher | 36 Terminal | 48 Housing |

Figure 3-2. Battery charging generator, exploded view.

(3) Inspect for shorts with a growler and steel strip. The steel strip will vibrate against the armature over a shorted area as the armature is turned.

(4) Inspect the field windings for worn or frayed insulation, defective connections, opens, and field current draw.

(5) Replace or repair all defective parts as necessary.

h. Assembly. Reassemble generator in direct reversal of disassembly as illustrated.

or sandpaper wrapped around commutator. Clean commutator thoroughly and cover with tape.

g. Installation. Refer to Operator's manual for installation instructions.

31. Generator Regulator

a. General. The generator regulator (Figure 3-1) is a watertight, fungus and corrosion resistant unit for military applications.

Specifications. Connections to the regulator are made by means of mating Ordinance-type receptacles on the vehicle wiring harness.

b. *Removal.* Refer to Operator's Manual.

c. Regulator Maintenance

(1) Test specifications for regulator model 111 8858 are as follows:

VOLTAGE REGULATOR

Air Gap (inches)-----	.084
Satisfactory Operating Range (volts).	13.9-14.9*
If outside range, adjust to (volts).	14.3*

CURRENT REGULATOR

Air Gap (inches)-----	.115
Satisfactory Operating Range (amp.).	38-42
If outside range, adjust to (amp.).	40*

CUTOUT RELAY

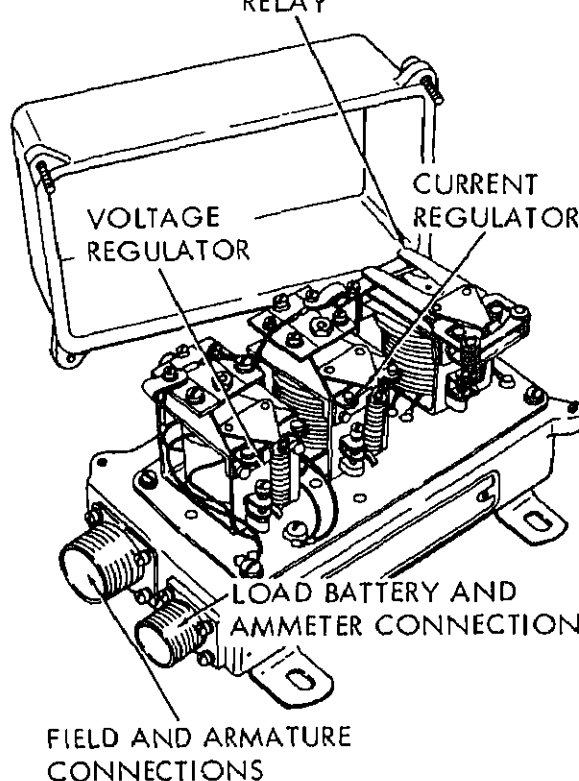
Air Gap (inches)-----	.048
Point Openings (inches).	.035
Satisfactory Closing Range (volts).	11.8-13.4*
If outside range, adjust to (volts).	12.8*

RESISTOR VALUES (OHMS)

A-----	40 (2)
B-----	375 (2)
C-----	100 (1)
D-----	100 (2)
E-----	20 (1)

THESE VALUES APPLY ONLY WHEN THE REGULATOR IS BEING TESTED AT OPERATING TEMPERATURE, ON THE VEHICLE, AND IN ACCORDANCE WITH THE PROCEDURE DESCRIBED IN THE FOLLOWING SECTION.

(2) Mechanical checks and adjustments (air gaps, point openings) must be made with the battery disconnected and the regulator removed from the vehicle.



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Figure 9-1. Generator regulator with cover removed.

Remembered that tungsten is extremely hard and platinum is relatively soft. Platinum points should be filed very lightly to avoid excessive loss of metal. Never use sandpaper or emery cloth to clean contact points.

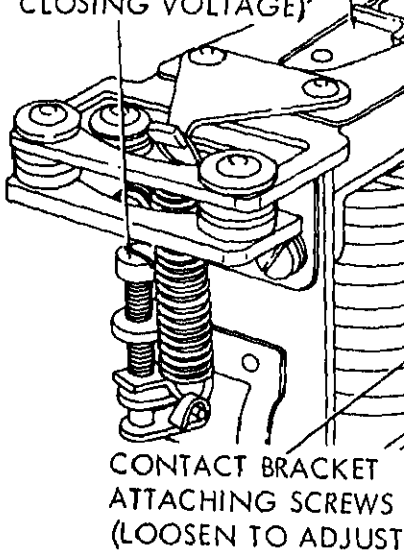
e. Regulator Checks and Adjustments (Figure 9-2)

(1) Cutout Relay. Three checks and adjustments are required on the cutout relay: air gap, point opening and closing voltage. Air gap and point opening are checked with the battery disconnected.

(a) Air Gap—Measure the air gap

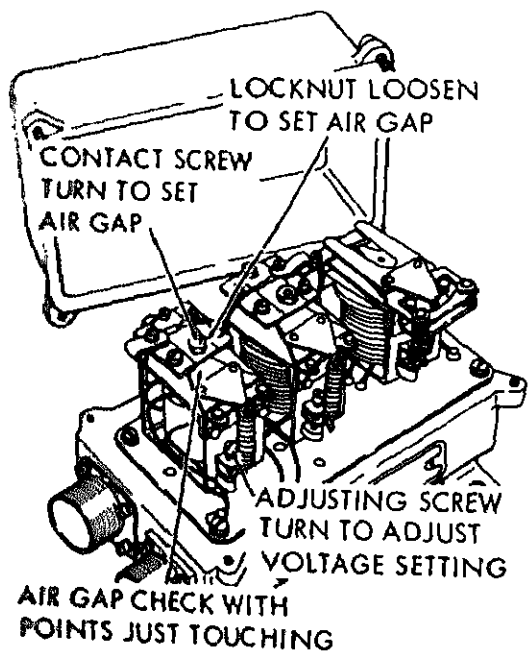
point opening and adjust by bending the upper armature stop.

(c) Closing Voltage—To check the closing voltage on the cutout relay, insert Special Testing Harness No. 1 (fig 9-4) in the generator circuit, and connect a voltmeter between T-1 (armature) and the ground screw at the end of the regulator (fig. 9-5). Gradually increase generator speed and note the voltage at which the relay contact points close. Adjust the closing voltage, if necessary, by turning the adjusting screw at the base of the cutout relay frame. Increasing the spiral spring tension increases the relay



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Figure 9-8. Cutout relay adjust-



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Figure 9-8. Voltage and current regulator adjustments

closing voltage—decreasing the tension lowers the closing voltage.

(2) Voltage Regulator. Two adjustments are required on the voltage regulator: air gap and voltage setting. It is called to fact that the AIR GAP is called the POINT OPENING is checked and adjusted.

(a) Air Gap—The air gap is measured between the armature and the core (not the residual pin) of the core next to the residual pin, with the points touching. The proper way to measure the air gap is to push the armature down until the points open, release until the points close, then measure the air gap. To measure the gap with the flat spring, push the contact screw raised up on the mounting plate. To adjust, loosen

such.

(b) Voltage Setting—(fig. 9-6). Disconnect battery cable from regulator, and connect voltmeter between regulator battery terminal, and ground screws in the end of the regulator. With the generator operating at approximately 3000 RPM and the regulator at operating temperature, note the voltage setting. Adjust by turning the adjusting screw at the base of the unit, thereby changing the spiral spring tension. Increasing the spring

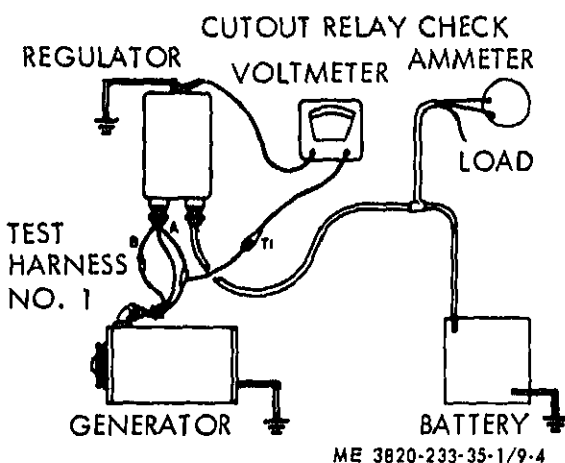
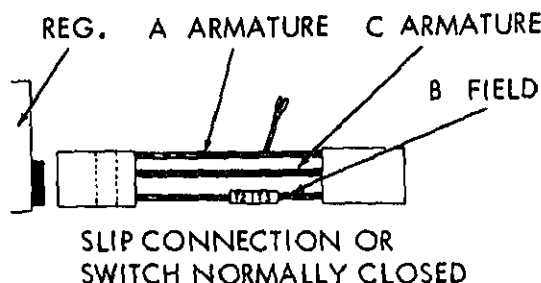


Figure 9-4. Meter connections for checking cutout relay closing voltage.



(3) Current Regulator. Two checks and adjustments are required on the current regulator: air gap and current setting. The AIR GAP and not the POINT OPENING is checked and adjusted—procedure being the same as for the voltage regulator above. Current Setting (fig. 9-7). To check the current regulator setting, it is necessary to keep the voltage regulator from operating so that the generator output can increase to the value for which the current regulator is adjusted, and thus cause the current regulator to operate. Three methods of preventing voltage regulator operation are available. Regardless of the method used, disconnect battery cable from the regulator and connect an accurate ammeter in series between these junctions. The ammeter will measure the current regulator setting. The three methods of preventing voltage regulator operation are:

(a) Battery Discharge Method—In this method, the battery is partly discharged by cranking the engine for 30 seconds with lights, and other accessories turned on. NEVER USE THE CRANKING MOTOR FOR MORE THAN 30 SECONDS AT A TIME WITHOUT PAUSING TO ALLOW THE CRANKING MOTOR TO COOL OFF. Excessive cranking will damage the cranking motor. Immediately after the cranking cycle, start the engine and allow the generator output to increase to its maximum as determined by the current regulator setting before rising battery voltage causes the voltage regulator to operate. Since battery voltage recovers very quickly, this method requires prompt action.

(b) Load Method—If a load approximating the current regulator setting is placed across the battery during the time that the

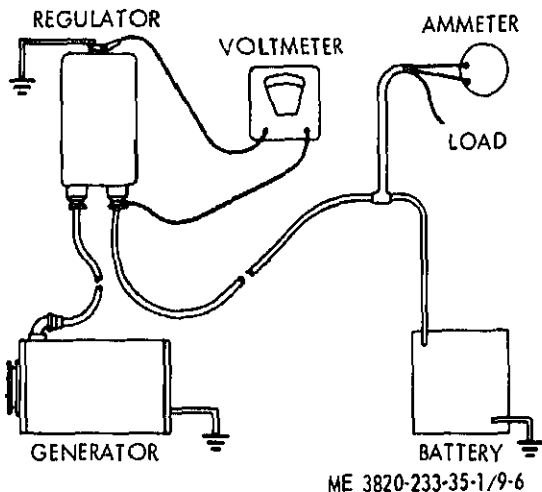


Figure 9-6. Meter connections for voltage regulator checks.

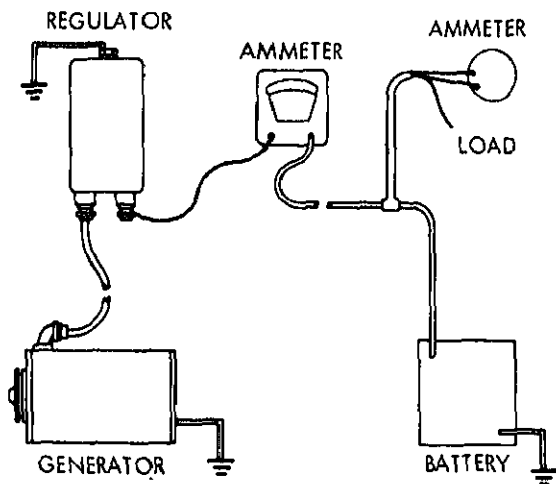


Figure 9-7. Meter connections for current regulator checks.

rent regulator setting, turn the adjustment screw at the base of the unit thereby change the spiral spring tension. Increasing the tension will increase the current setting. After each change of adjustment, reduce generator speed until cutout relay opens, then return speed and read current. (Higher residual magnetism resulting from uncontrolled voltage during this test will cause the voltage regulator to regulate at an abnormally low voltage after the jumper is removed. To restore proper operation, the generator must be "cycled", that is, stopped and restarted. Do not attempt to check voltage regulator after using JUMPER LEAD METHOD until this condition has been corrected.)

f. Installation. Refer to Operator's Manual.

32. Radiator Assembly

a. General. The radiator assembly is mounted on the front of the engine. As hot water flows through the radiator core, it is cooled by air forced through the core by a belt-driven fan. A guard is attached to the fan shroud to prevent loose clothing, hands, and other objects from becoming entangled in the fan blades.

b. Removal and Disassembly

- (1) Remove the power unit (para 24).
- (2) Drain the radiator.
- (3) Remove the hoods, side panels, and tie rods (Operator's Manual).
- (4) Remove and disassemble the radiator assembly in the numerical sequence as illustrated on figure 10.

c. Cleaning, Inspection, and Repair

(1) Flush the inside of the radiator with an approved cleaning solvent.

(2) Plug the radiator openings. Insert an air hose in radiator outlet pipe. Immerse

d. Reassembly and Installation

- (1) Refer to figure 10 and assemble and install the radiator assembly.
- (2) Install the hoods, side panels, and rods (Operator's Manual).
- (3) Fill the radiator with coolant.
- (4) Install the power unit (para 24).

9. Water Pump

a. *General.* The water pump is mounted on the front end of the blower and is driven by the lower blower rotor shaft. The centrifugal type water pump circulates coolant through the cylinder block, cylinder head, radiator, and oil cooler.

b. *Removal.* Refer to Operator's Manual.

c. *Disassembly.* Disassemble the water pump in the numerical sequence as illustrated on figure 11.

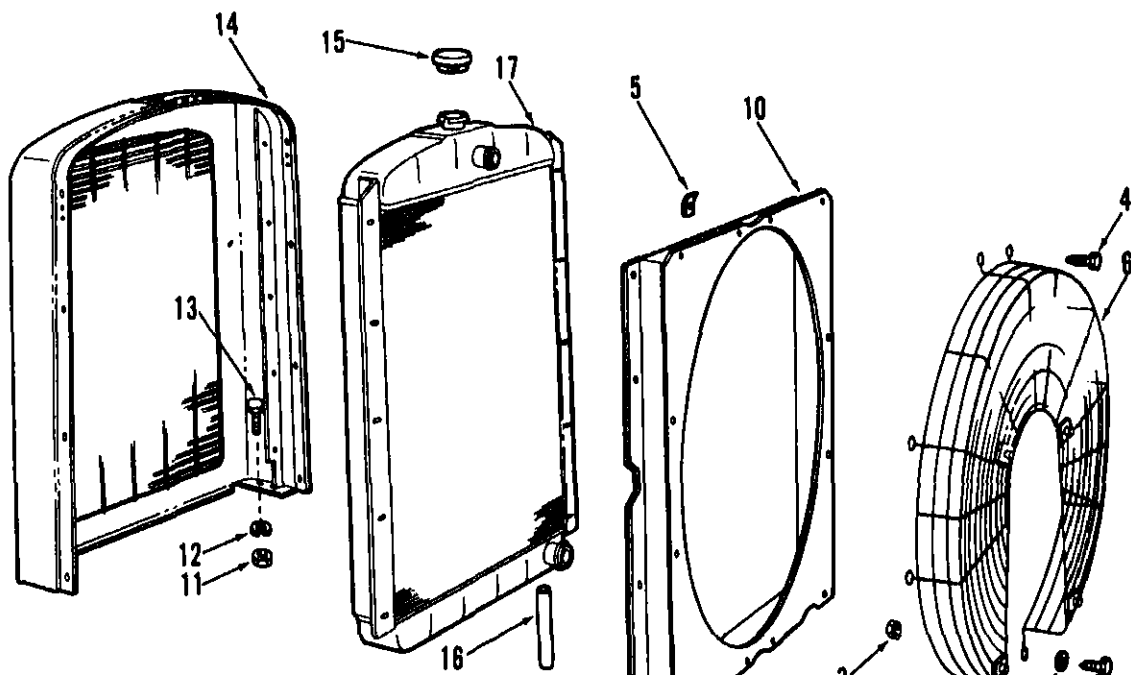
Note. It may be necessary to use an arbor press to separate water pump shaft from impeller.

d. Cleaning, Inspection, and Repair

(1) Clean all parts with an approved cleaning solvent.

Caution. Do not immerse pump shaft assembly in cleaning solvent. Dirt may be washed into sealed shaft bearing and cannot be entirely removed.

(2) Inspect pump body, pump shaft, seals and impeller for cracks scoring wear, or



pounds.

e. Reassembly. Reassemble the water pump in the reverse numerical sequence as illustrated on figure 11.

(1) If steel insert is replaced, be sure the counterbore in pump body is thoroughly cleaned before installing new insert. Press insert in until it contacts the shoulder in pump body.

Note. Do not mar the seal contact surface of the insert when pressing it into the pump body.

(2) Install slinger on the pump shaft assembly with the flange of the slinger approximately 3/16 inch from end of the outer race of the shaft assembly bearing.

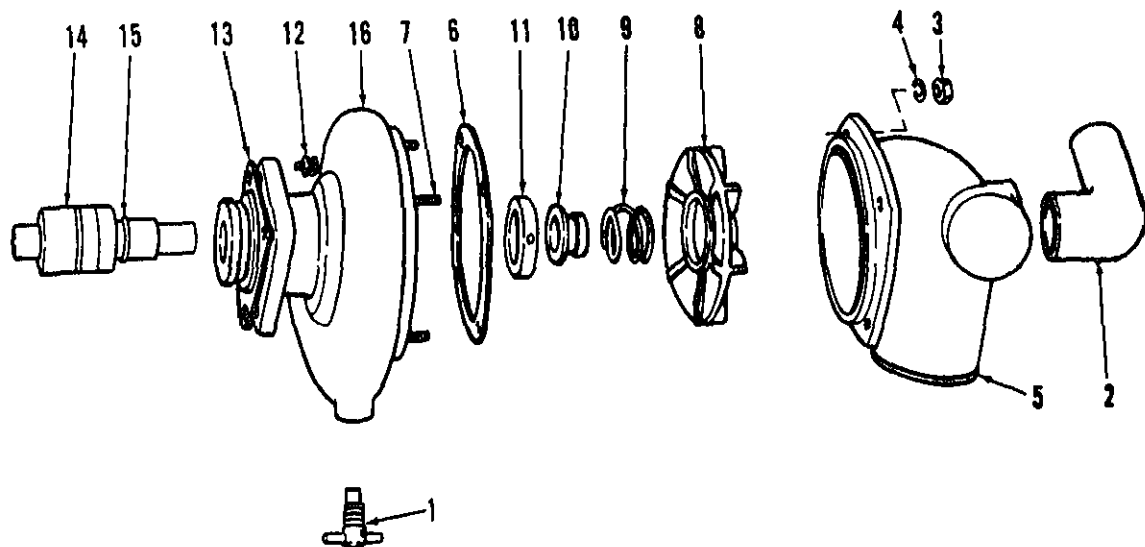
bearing touches the shoulder in the pump body.

(4) Clean surface of pump seal, and apply a thin coat of liquid soap on inside surface of seal. Slide seal onto pump shaft until it is seated firmly against the pump body insert.

(5) Install pump seal spring with the small end toward the seal.

(6) Support bearing end of pump shaft on an arbor press and press impeller onto the shaft. Press until face of impeller hub is flush with the end of the pump shaft.

(7) Rotate pump shaft by hand to be sure impeller does not contact pump body.



pump cover over studs and secure to pump body with four lockwashers and nuts.

(9) Install drain cock.

f. Installation. Refer to Operator's Man-

Hydraulic Governor and Governor Drive

a. General

(1) The hydraulic governor regulates the engine speed under varying load conditions, and serves as an automatic shutdown device when there is a malfunction in the lubricating oil pressure system. Should the engine fail to supply oil to the governor, the servo motor piston will drop, allowing the fuel rod to return to the NO FUEL position.

(2) The governor is driven by the upper blower rotor through a horizontal drive shaft and bevel gear, and a vertical driven shaft and bevel gear. Both are mounted on ball bearings and located in the governor drive housing.

b. Removal. Refer to Operator's Manual.

c. Disassembly. Disassemble the governor and governor drive assembly in the numerical sequence as illustrated on figure 12.

d. Cleaning, Inspection, and Repair

(1) Wash all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect pilot valve plunger for scratches or burrs. Defective areas may be corrected with a fine India stone.

Note. Do not round off edges of plunger when dressing it with the India stone.

(3) Inspect servo motor piston for scratches or burrs. Correct defective areas with a fine India stone.

Note. Do not round off edges of piston when dressing it with the India stone.

(1) Reassemble the governor and governor drive assembly in the reverse of the numerical sequence as illustrated on figure 12.

(2) When reassembling bearing (76) and drive shaft (78), support bearing on the bed of an arbor press, and press drive shaft into bearing until shoulder of shaft is against the bearing.

(3) To reassemble bearing (77), sleeve (76), and driven shaft (78), start bearing on the bed of an arbor press, and press shaft followed by the sleeve. Properly support sleeve on the bed of an arbor press, and press shaft into bearing and sleeve.

f. Installation and Adjustment. Refer to the Operator's Manual.

35. Fuel Pump

a. General. The fuel pump is mounted on the rear of the blower assembly and is driven by the lower blower rotor. The fuel pump draws fuel from the supply tank and delivers it at correct pressure to the fuel injectors.

b. Removal

c. Disassembly. Disassemble the fuel pump in the numerical sequence as illustrated on figure 13.

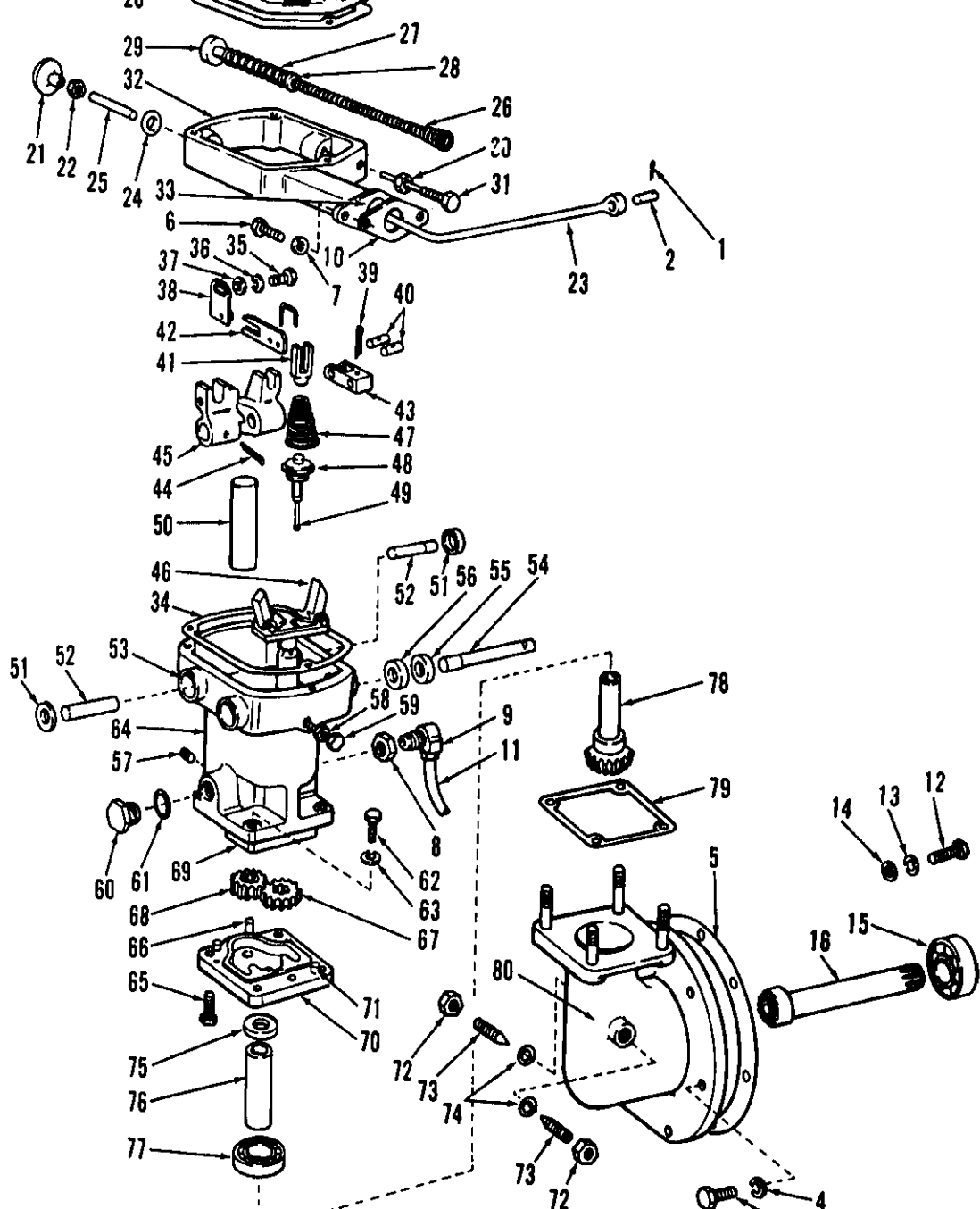
Note. Use extreme care when removing the fuel pump shaft as score marks on the square end of shaft will damage the oil seal contact surface.

d. Cleaning, Inspection, and Repair

(1) Clean all of the parts with an approved cleaning solvent and dry them thoroughly.

(2) Inspect oil seals for nicks or cracks. If oil seals are removed, they must be discarded and replaced with new seals.

(3) Inspect pump shafts and gears for wear or scoring. The driven shaft is served as a gear and shaft assembly only. Rep-



5 Gasket	25 Spacer	45 Lever	65 Bolt
6 Bolt	26 Spring	46 Ball head assembly	66 Stud
7 Lockwasher	27 Spring	47 Spring	67 Gear
8 Nut	28 Disc	48 Bearing	68 Gear
9 Elbow	29 Collar	49 Plunger	69 Ring
10 Gasket	30 Nut	50 Piston	70 Base
11 Tube	31 Screw	51 Plug	71 Pin
12 Bolt	32 Sub cap	52 Shaft	72 Nut
13 Lockwasher	33 Plug	53 Bushing	73 Setscrew
14 Washer	34 Gasket	54 Shaft	74 Gasket
15 Bearing	35 Bolt	55 Seal	75 Ring
16 Shaft	36 Lockwasher	56 Seal	76 Sleeve
17 Screw	37 Washer	57 Plug	77 Bearing
18 Washer	38 Bracket	58 Nut	78 Shaft
19 Cover	39 Pin	59 Screw	79 Gasket
20 Gasket	40 Pin	60 Plug	80 Housing

Figure 12—Continued.

(6) Inspect drive coupling fork for wear or other damage. Replace defective coupling.

(7) Test valve retaining spring. Apply a load of 7.1 pounds to 7.5 pounds to the spring. The spring should compress to a length of 1.18 inch. If the spring fails to meet this specification, replace the valve retaining spring.

e. Reassembly. Reassemble the fuel pump in the reverse of the numerical sequence as illustrated on figure 13.

Note. Install fuel pump drive gear over the end of the drive shaft which is not squared to prevent scoring the square end of the shaft.

Note. Apply only a thin coat of approved sealant on the face of the pump cover outside of the gear pocket area. Too much sealant could increase the clearances and affect pump efficiency. Do not apply sealant into the gear pocket, or damage to the gears and shafts will result.

f. Installation. Refer to the Operator's Manual.

36. Blower and Blower Drive Assembly

b. Removal

(1) Drain the cooling system (Operator's Manual).

(2) Remove the oil lines (Operator's Manual).

(3) Remove the fuel filter lines (Operator's Manual).

(4) Remove the fuel pump (Operator's Manual).

(5) Remove the water pump (operator's Manual).

(6) Remove the hydraulic governor (Operator's Manual).

(7) Remove the air inlet housing blower, and blower drive assembly in the numerical sequence as illustrated on figure 14-1.

c. Disassembly

(1) Disassemble the air inlet housing in the numerical sequence as illustrated on figure 14-2.

(2) Disassemble the blower and blower drive assembly in the numerical sequence as illustrated on figures 14-3 and 14-4.

d. Cleaning, Inspection, and Repair

(1) Clean all of the blower parts with an approved cleaning solvent and dry

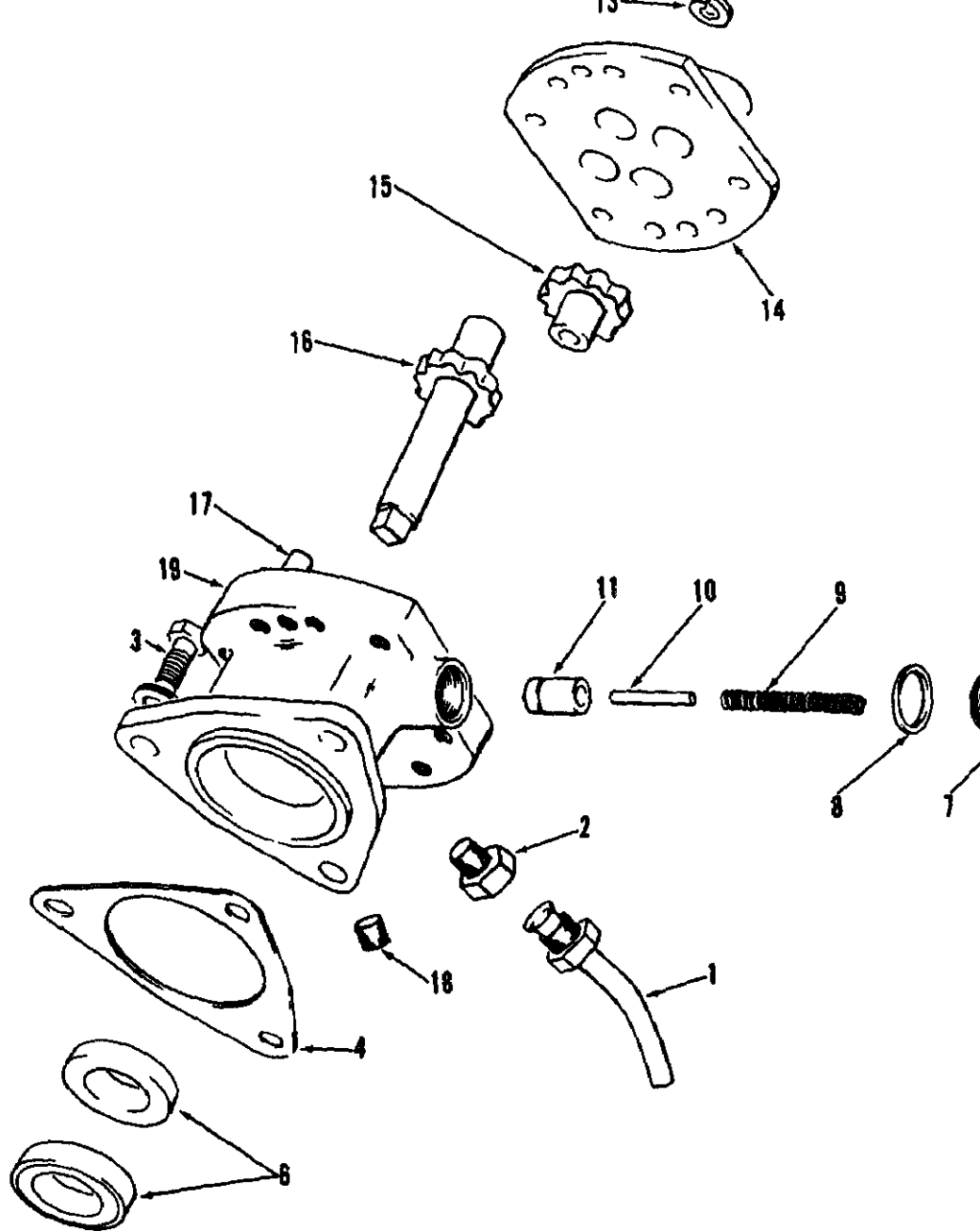


Figure 13—Continued.

cloth. Replace excessively scored or burred rotors.

(4) Inspect rotor shaft serrations for wear, burrs, or peening. Replace defective rotor.

(5) Inspect the inside surfaces of the blower housing for burrs or scoring. Clean up slightly scored or burred areas with emery cloth.

(6) Inspect inside face of each end plate. If the finished face is slightly scored or burred, clean with emery cloth.

(7) Inspect the serrations in the blower timing gears for wear and peening. Inspect gear teeth for wear, chipping, or other damage. Backlash between gear teeth should not exceed 0.004 inch. Replace defective or damaged timing gears as a set.

(8) Inspect blower drive shaft serrations for wear or other damage. Replace a damaged or bent shaft.

(9) Inspect the serrations inside the rotor drive hub for wear or other damage. Replace a defective drive hub.

(10) Inspect the blower drive coupling springs and cam for wear and other damage. Replace defective parts.

(11) Inspect the thrust washers. Replace worn or scored washers.

(12) Inspect bearings for binding, wear, or scoring. Replace a defective bearing.

(13) Inspect the blower drive coupling support, cam, spring seats, and spring packs for wear or other damage. Replace any defective parts.

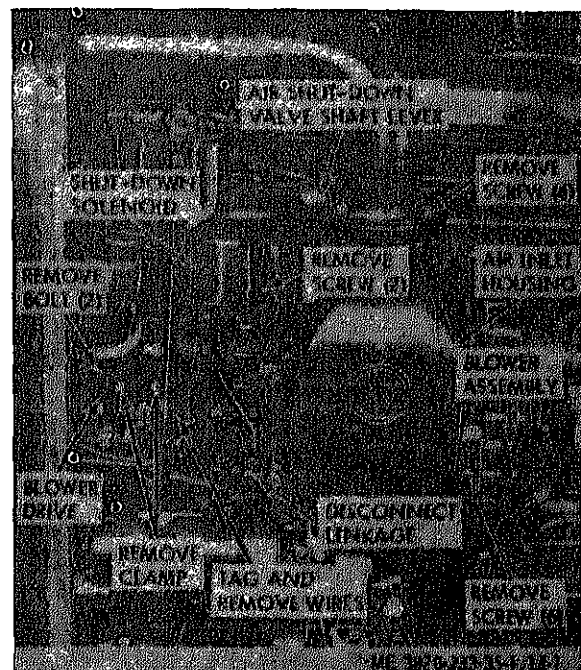
(14) Inspect blower drive gear teeth for chipping, wear, or scoring. Replace a defective gear.

(15) Replace worn or excessively damaged air inlet housing, blower, and blower drive parts.

c. Reassembly

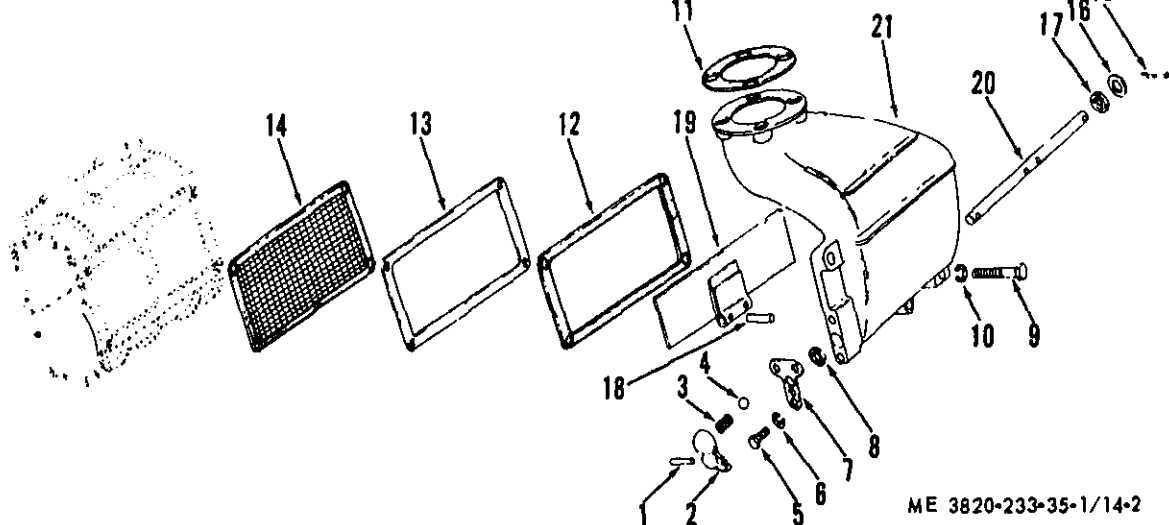
(1) Reassemble the blower assembly in the reverse of the numerical sequence as illustrated on figure 14-4.

(a) Press oil seal (44) into the end plate (37). Position the oil seal approximately .005 inch below the finished face of



STEP 1. REMOVE SHUT-DOWN SOLENOID.

STEP 2. DISCONNECT SHUT-DOWN WIRE



1 Pin	7 Lockplate	13 Plate	19 Valve
2 Lever	8 Ring	14 Screen	20 Shaft
3 Spring	9 Bolt	15 Pin	21 Housing
4 Ball	10 Lockwasher	16 Washer	
5 Bolt	11 Gasket	17 Seal	
6 Lockwasher	12 Gasket	18 Pin	

Figure 14-2. Air inlet housing, exploded view.

(c) Torque bearing retainer bolts (26 and 41) to 7-9 foot-pound.

(d) Torque water pump drive coupling retaining bolt (39) to 18 foot-pound.

(e) Torque end plate cover (37) mounting bolts (35) to 13-17 foot-pound.

(f) Before installing the blower rotor timing gears (24) check rotor-to-end plate and rotor-to-housing clearances. See figure 14-5.

(g) Torque rotor timing gear retaining bolts (20) to 55-65 foot-pound.

(h) After the blower rotors (33 and 34) and timing gears (24) are installed, time the blower rotors as shown on figure 14-5.

Note. When the right hand helix gear is moved out, the right hand helix rotor will turn coun-

Note. Installing a .003 inch shim in back of a rotor gear will turn the rotor .001 inch.

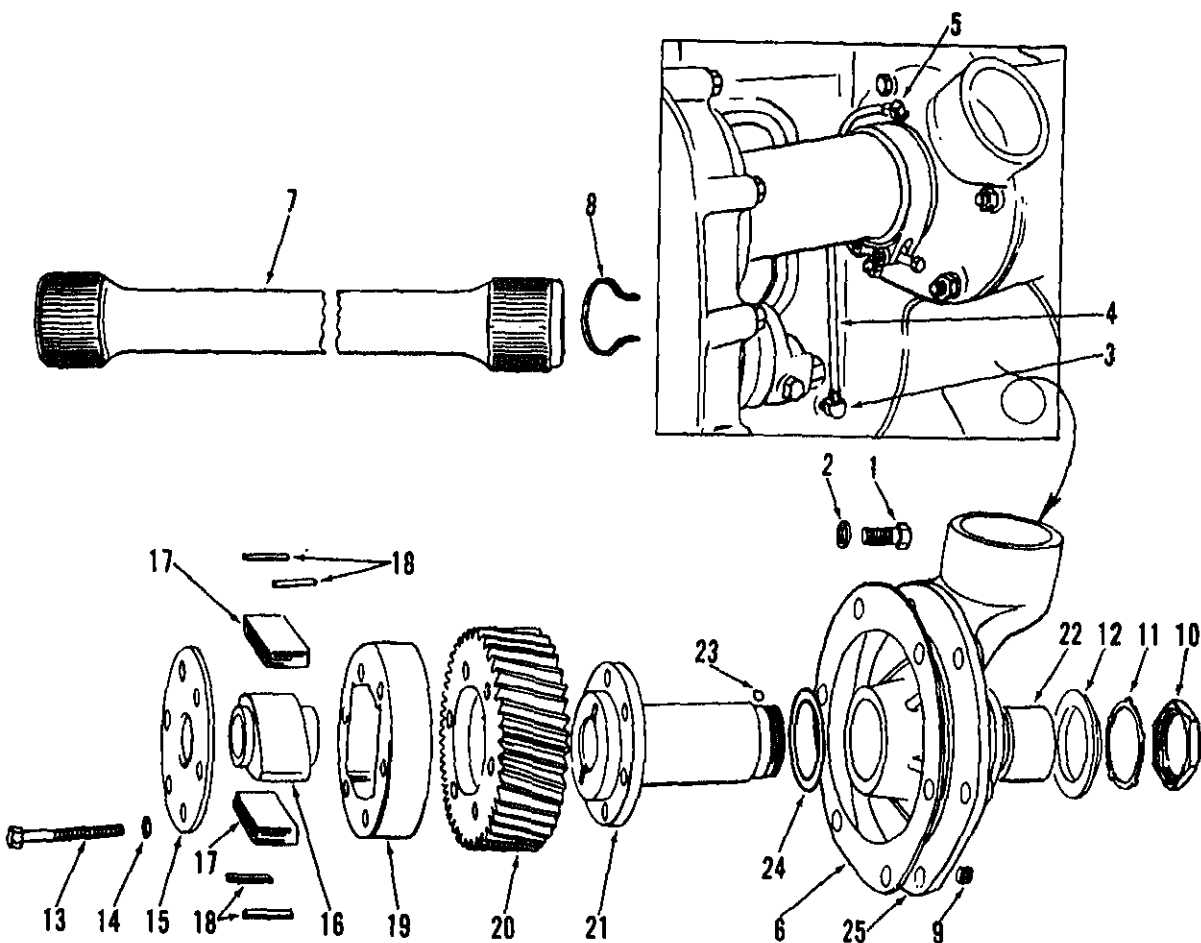
(j) Determine the minimum clearances at points "A" and "B" shown on figure 14-5. Measure clearances at the ends of each lobe, making 12 measurements in all.

(k) Refer to figure 14-5 and measure the clearance between each rotor lobe and the blower housing at both the inlet and outlet side. Twelve measurements are required.

(l) Torque the plate to hub bolts (14) to 25-30 foot-pound.

(m) Torque plate to gear bolts (11) to 25-30 foot-pounds.

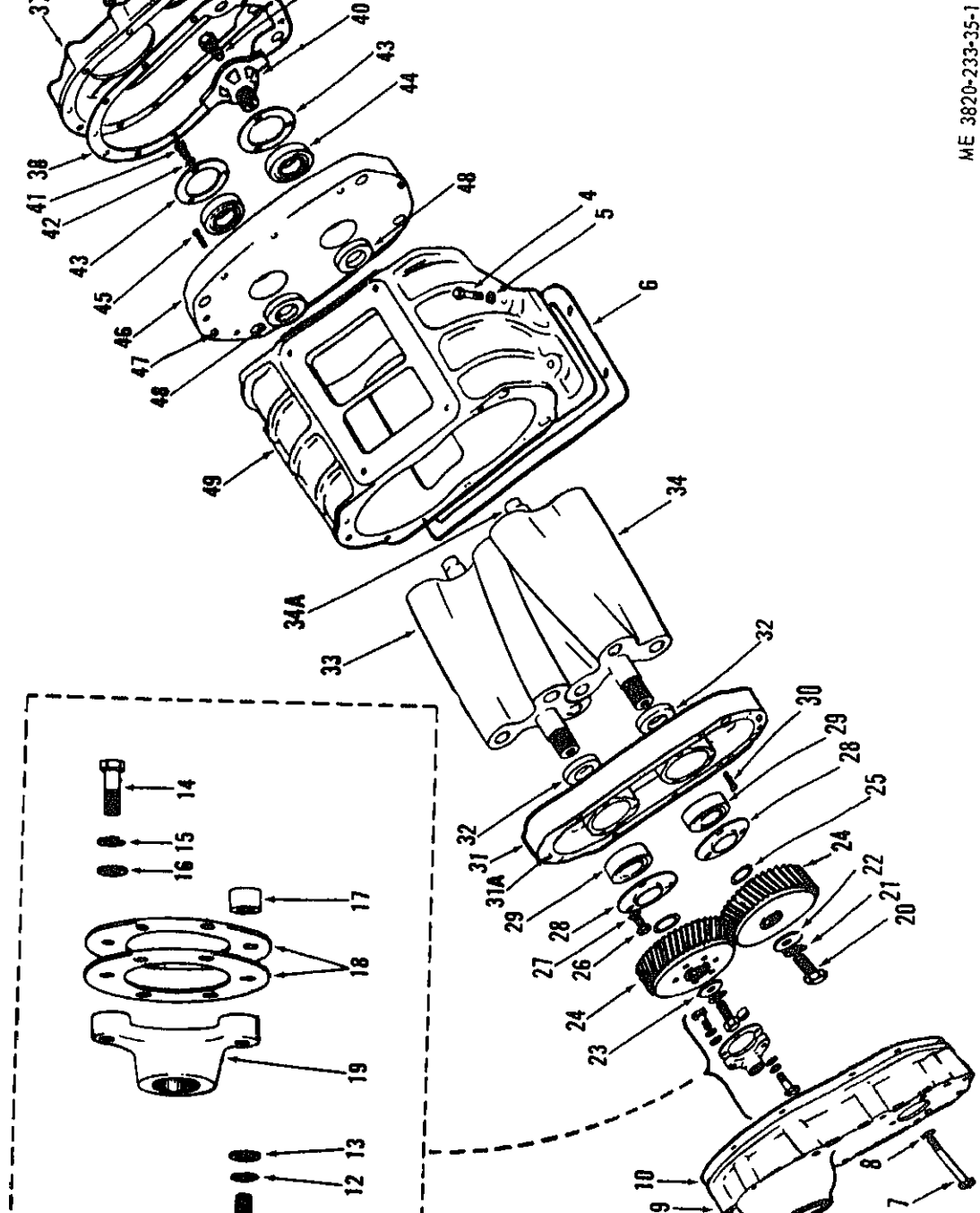
(n) Measure the runout of the rotor drive hub splines with an indicator. The spline runout must not exceed .020 inch total



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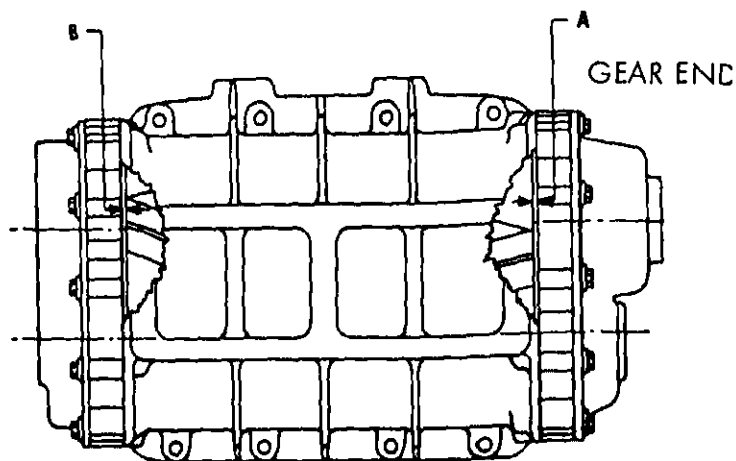
- | | | | |
|--------------|---------------|-------------|------------|
| 1 Bolt | 8 Ring | 15 Retainer | 22 Bearing |
| 2 Lockwasher | 9 Plug | 16 Cam | 23 Ball |
| 3 Tee | 10 Nut | 17 Spring | 24 Washer |
| 4 Pipe | 11 Lockwasher | 18 Seat | 25 Support |
| 5 Elbow | 12 Washer | 19 Support | |
| 6 Gasket | 13 Bolt | 20 Gear | |
| 7 Shaft | 14 Lockwasher | 21 Hub | |

Figure 14-3. Blower drive, exploded view.



15	Lockwasher	28	Retainer	39	Bolt
16	Washer	29	Bearing	40	Coupling
17	Spacer	30	Screw	41	Bolt
18	Plate	31	Plate	42	Lockwasher
19	Hub	31A	Pin	43	Retainer
20	Bolt	32	Seal	44	Bearing
21	Lockwasher	33	Rotor	45	Screw
22	Disc	34	Rotor	46	Plate
23	Disc	34A	Shaft	47	Pin
24	Gear set	35	Bolt	48	Seal
25	Shim	36	Lockwasher	49	Housing
26	Bolt	37	Cover		

Figure 14-4—Continued.



	A	B	C	CC	D	E
MIN.	.007	.009	.014	.002	.015	.004
MAX.				.006		

TIME ROTORS TO DIMENSIONS ABOVE

